# CONNECTICUT RIVER VALLEY PESTICIDE STUDY

## For
## THE MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL QUALITY ENGINEERING

**Division of Water Supply**

**March 1988**

Prepared by
Stone & Webster Engineering Corporation
Boston, Massachusetts

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# PESTICIDE STUDY

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CHEMICALS

TABLE OF CONTENTS

LIST OF TABLES

CHEMICALS

# 1. SUMMARY

This report presents the findings of the Connecticut River Valley Pesticide Study which was performed by Stone & Webster Engineering Corporation (S&W) under contract to the Massachusetts Department of Environmental Quality Engineering, Division of Water Supply (DEQE/DWS), between 8/86 and 2/88. The study covers the 20 town region identified on Figure 1 and entailed the mapping of pesticide related land use activities, water distribution systems, and water supplies which have been closed due to pesticide contamination or have contained detectable concentrations of pesticides. The objective of the study was to present DEQE/DWS, with data and information which would enable them to determine where and to what extent agricultural chemicals are contaminating water supplies in the Connecticut River Valley of Massachusetts. The data is also intended to serve as a base of comparison for future monitoring and tracking of contamination.

While actual agricultural acreage in Massachusetts has decreased over the past 20 years, the use of agricultural chemicals to control weeds and pests has increased during that time (USDC, 1982, 1974, 1969). For tracking of agricultural activities, two years, 1972 and 1985, were selected for mapping by DEQE/DWS, based on availability of data. For the 1972 Pesticide Related Land Use Activity overlays, black and white aerial photographs corresponding to the land use maps developed by McConnell and Mueller for the "Massachusetts Map Down" in 1972 (McConnell, 1973) were borrowed from the University of Massachusetts. Data for the 1985 Pesticide Related Land Use overlays included color infrared aerial photographs and data and slides (of aerial photos) from the U.S. Agricultural Soil Conservation and Stabilization Service offices corresponding to the study area. Information on agricultural land use and agricultural chemical use is provided in Section 3 of this report.

In order to identify current contamination as well as potentially sensitive areas, Agricultural Chemical map overlays and Water Supply map overlays were developed to show all current locations of public water supplies and distribution systems along with locations of contamination and an identification of the chemical(s) which are present. This information when combined with the Agricultural Land Use overlays provides the means for identifying potential sources of contamination to existing and future water supplies. All information regarding chemical contamination was provided by DEQE/DWS. Water supply and contamination is discussed in Section 4 of this report.

Seven agricultural chemicals - Alachlor, Aldicarb, Carbofuran, 1,2-Dichloropropane, Dinoseb, Ethylene Dibromide, and Oxamyl - were the focus of the water contamination investigation and mapping effort. The chemicals are under varying levels of regulation by federal and state government agencies and were all recommended by the Cooperative Extension Service of the U.S. Dept of Agriculture for agricultural application in at least one of the study years. While a detailed chemical analysis was not part of this study, a DEQE-requested review of literature on the chemicals was. The results of the literature review of these chemicals are presented in Section 2 and Appendix A of this report.

In addition to the seven agricultural chemicals presented in detail, Appendixes B and C contain comprehensive lists of agricultural chemicals which were recommended by the Cooperative Extension Service for agricultural use in New England in 1972 and 1985, respectively. The lists are sorted by chemical as well as by crop use for each year. Information presented on the map overlays is described within the text of corresponding sections of this report.

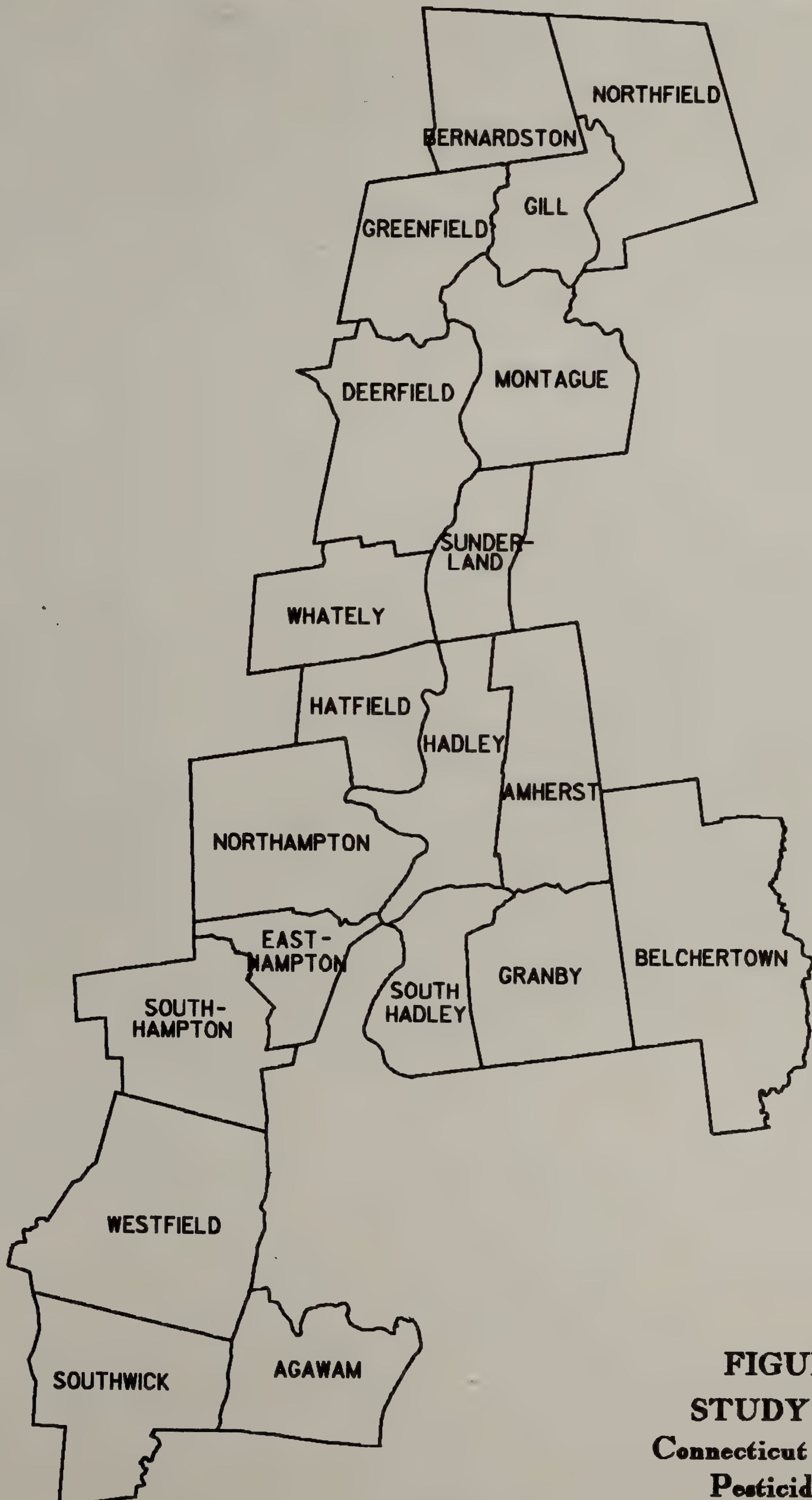



**FIGURE 1**
**STUDY AREA**
**Connecticut River Valley**
**Pesticide Study**

CHEMICALS
LAND USE ACTIVITY
AND PESTICIDE

# 2. AGRICULTURAL CHEMICALS

Pesticides were originally developed for military purposes during World War II. In the 1950s, however, pesticides became a major factor in U.S. agriculture with farmers relying more and more on chemical controls because they provided a relatively inexpensive means of reducing crop losses to pests. As a consequence, the use of pesticides increased every year until 1981 (Meachim, 1/85). Pesticides were first found in groundwater and drinking water in 1979 when Aldicarb was discovered on Long Island, N.Y. and DBCP (Dibromochloropropane) was found in California. Since 1979, at least 14 additional agricultural chemicals have been detected in the waters of 23 states (MIPTF, 1986a). Table 2-1 identifies acres on which agricultural chemicals were used between 1969 and 1982 within Massachusetts and also, more specifically, within Hampden, Hampshire, and Franklin Counties.

## 2.1 Description of Chemicals

Under DEQE/DWS direction, seven agricultural chemicals - Alachlor, Aldicarb, Carbofuran, 1,2-Dichloropropane, Dinoseb, Ethylene Dibromide, and Oxamyl - were noted to be of primary concern and the focus of the water contamination investigation and mapping effort. Of the seven chemicals, only Ethylene Dibromide has been banned from use by EPA. Within Massachusetts, 1,2-Dichloropropane has been banned since 1985 and Dinoseb was suspended from use in late 1986. Under a recent decision, Alachlor may be banned from use in Massachusetts. Oxamyl and Aldicarb are on the Massachusetts Restricted Use list and Aldicarb is on the EPA's Restricted Use list. Aldicarb and Carbofuran are currently under review by EPA. In addition, Aldicarb, Carbofuran, Dinoseb and Oxamyl are designated as "Acutely Toxic" by EPA, and 1,2-Dichloropropane and Dinoseb are included on EPA's Phase 1 list of Hazardous Constituents for Groundwater Monitoring.

Each of the seven chemicals, with the exception of Ethylene Dibromide, was recommended for use on crops in 1985. Only four of the seven - Alachlor, Dinoseb, Ethylene Dibromide, and 1,2-Dichloropropane - were recommended for use in 1972. Table 2 lists EPA classifications regarding each of the seven chemicals. Appendix A provides detailed information regarding the uses and toxicity of each of the chemicals specified above. Table 2-3 is a tabulation of 35 agricultural chemicals of concern to DEQE/DWS by general crop use. Appendixes B and C are comprehensive lists of all chemicals recommended for specific crops in New England in 1985 and 1972 by both crop use and chemical.

The Commonwealth of Massachusetts has developed a monitoring program designed to test for the presence of the seven agricultural chemicals in the waters of Massachusetts. Information on well contamination gathered as part of that monitoring effort is included in Section 4 of this report. In addition, in order to interpret the sampling results from a public health viewpoint, interim drinking water guidelines (IDWG) were developed by DEQE to determine whether a water source was unacceptably contaminated (MIPTF 1985). Table 2-4 lists Interim Drinking Water Guidelines for the seven chemicals reviewed as part of this study.

TABLE 2-1

AGRICULTURAL CHEMICALS USAGE

| YEAR | MASS. | FRANKLIN | HAMPDEN | HAMPSHIRE |
|---|---|---|---|---|
| | | COUNTY (1000 Acres on which used) | | |
| **Sprays, dusts, granules, fumigants, etc to control:** | | | | |
| Insects on hay and other crops | | | | |
| 1982 | 45.5 | 4.1 | 2.7 | 6.9 |
| 1978 | 39.8 | 3.0 | 3.0 | 5.1 |
| 1974 | 38.2 | 2.2 | 2.7 | 5.2 |
| 1969 | 35.8 | 3.7 | 3.5 | 4.9 |
| Nematodes in crops | | | | |
| 1982 | 4.1 | .8 | .3 | .9 |
| 1978 | 4.8 | .7 | .9 | .3 |
| 1974 | 1.8 | .7 | .5 | .2 |
| 1969 | 1.0 | .1 | .2 | .3 |
| Diseases in crops and orchards | | | | |
| 1982 | 20.1 | 2.2 | 1.1 | 3.6 |
| 1978 | 21.1 | 2.6 | 3.0 | 3.1 |
| 1974 | 13.0 | 1.6 | 1.5 | 1.6 |
| 1969 | 12.4 | 1.2 | 1.2 | 1.2 |
| Weeds, grass, or brush in crops and pasture | | | | |
| 1982 | 57.1 | 8.1 | 4.0 | 8.5 |
| 1978 | 59.4 | 6.7 | 5.6 | 9.7 |
| 1974 | 40.4 | 5.5 | 3.2 | 6.2 |
| 1969 | 36.0 | 4.2 | 2.8 | 5.3 |
| **Chemicals used for defoliation or control of crops or thinning of fruit** | | | | |
| 1982 | 6.5 | .6 | .5 | 1.2 |
| 1978 | 6.4 | 1.2 | .9 | 1.0 |
| 1974 | 2.4 | .3 | .1 | .4 |
| 1969 | 3.3 | .4 | .1 | .4 |

Source: U.S. Dept. of Commerce, Bureau of the Census, 1982 Census of Agriculture, Volume 1, Geographic Area Series, Part 21, Massachusetts (AC82-A-21), 9/84.

U.S. Dept. of Commerce, Bureau of the Census, 1974 Census of Agriculture, Volume 1, Part 21, Massachusetts, 4/77.

U.S. Dept. of Commerce, Bureau of the Census, 1969 Census of Agriculture, Volume 1, Part 21, Massachusetts.

TABLE 2-2

EPA CLASSIFICATIONS

| | Banned | Restricted | Under Review | Acutely Toxic | Hazardous Waste | Hazardous Substance | Hazardous Constituent for Groundwater Monitoring | Priority Pollutant |
|---|---|---|---|---|---|---|---|---|
| Alachlor | (MA)[2] | * | | | | | | |
| Aldicarb | | * | * | * | | | | |
| Carbofuran | | * | * | * | | | | |
| Dinoseb | [1] | * | | * | | | * | |
| 1,2-Dichloropropane | (MA)[2] | | | | * | | * | * |
| Ethylene Dibromide | * | | | | * | * | | |
| Oxamyl | | (MA) | | * | | | | |

NOTE:

[1]Suspended by EPA emergency suspension order 10/86.
[2]Banned by Massachusetts.

TABLE 2-3

1985 AND 1972
RECOMMENDED CHEMICAL USE BY CROP TYPE*

Code:

1985 = 1
1972 = 2

| | Crop Type | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemical Name | Mixed Veg. | Field Corn | Sweet Corn | Indian Corn | Forage | Apples | Other Tree Fruit | Berries | Nursery Crops | Potatoes | Tobacco | Turf Grass | Xmas Trees | Melons | Squash Pumpkin | RR ROW | Trans ROW |
| Alachlor | | 1,2 | 1 | 1 | 1,2 | | | | 1 | | | | | | | | |
| Aldicarb | | | | | | | | | | 1 | | | | | | | |
| Ametryn | | 1 | 1 | 1 | 1 | | | | | | | | | | | 1 | |
| Atrazine | | 2 | 2 | | 2 | | | | | | | | | | | | |
| Bentazon | 1 | | 1 | 1 | | | | | | | | 1 | | | | | |
| Bromacil | | | | | | | | | | | | | 1 | | | | |
| Butylate | | 1,2 | 1,2 | 1 | 1,2 | | | | | | | | | | | | |
| Carbofuran | 1 | | 1 | 1 | | | | 1 | | 1 | | | | | | | |
| Chlordane | 2 | 2 | 2 | 2 | | | | 2 | | | | | | | | | |
| Chlorothalonil | 1,2 | | | | | | 1 | 1 | | 1,2 | | | | 1,2 | 1,2 | | |
| Cynazine | | 1 | | | 1 | | | | | | | | | | | | |
| Cycloate | 1,2 | | | | | | | | | | | | | | | | |
| Dalapon | 1,2 | | | | | 1,2 | 1,2 | | 2 | 1 | | | | | | | |
| Dicamba | | 2 | | | 2 | | | | | | | 2 | 2 | | | | |
| 2,4-D | 2 | 1,2 | | | 1,2 | 1,2 | 1,2 | 1 | | | 1 | 2 | 2 | | | 1 | 1 |
| 1,2-Dichloro-propane | 1,2 | | | | | | 1 | 2 | 1 | 2 | | | | | | | |

TABLE 2-3 (Cont)

| Chemical Name | Crop Type | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mixed Veg. | Field Corn | Sweet Corn | Indian Corn | Forage | Apples | Other Tree Fruit | Berries | Nursery Crops | Potatoes | Tobacco | Turf Grass | Xmas Trees | Melons | Squash Pumpkin | RR ROW | Trans ROW |
| Dinoseb | 1,2 | 1,2 | 1,2 | 1 | 1,2 | | | | | 1,2 | | | | 1 | 1,2 | | |
| Diphenamid | 1,2 | | | | | | | 1,2 | 2 | | 2 | | | | | | |
| Disulfoton | | | | | | 1 | | 1,2 | | 1,2 | | | | | | | |
| Diuron | 1 | | | | | 1,2 | 1 | 1 | | | | | | | | 1 | |
| Ethylene Dibromide | | | | | | | | 2 | | | 2 | | | | | | |
| Fonofos | 1 | | 1 | 1 | | | | | | 1 | | | | | | | |
| Hexazinone | | 1 | | | 1 | | | | | | | | 1 | | | | |
| MCPA | | 2 | | | 2 | | | | | | | | | | | | |
| Maleic Hydrazide | | | | | | | | | | 2 | | | | | | | |
| Methomyl | 1,2 | | 1 | 1 | | 1 | 1 | | | 1,2 | | | | | 1 | | |
| Metolachlor | 1 | 1 | 1 | 1 | 1 | | | | 1 | 1 | | | | | | | |
| Metribuzin | 1 | | | | | | | | | 1 | | | | | | | |
| Oxamyl | | | | | | 1 | | | | | 1 | | | | | | |
| Picloram | | | | | | | | | | | | | | | | | 1 |
| Prometone | | | | | | | | | | | | 1 | | | | | |
| Pronomide | 1 | | | | | | | | 1 | | | | 1 | | | | |
| Symazine | 1,2 | 1,2 | | | 2 | 1,2 | 1,2 | 1,2 | 1,2 | | | 1,2 | 1,2 | | | | |
| Tebacil | | 1 | | | 1 | 2 | 1,2 | 1 | | | | | | | | | |
| 2,4,5-T | | | | | | | | | | | | | 2 | | | | 2 |

*Recommendations by New England Agricultural Extension Service

TABLE 2-4

COMMONWEALTH OF MASSACHUSETTS
INTERIM DRINKING WATER GUIDELINES

| | |
|---|---|
| Alachlor | 2.0 ppb |
| Ethylene Dibromide | 0.04 to 0.10 ppb (supply monitored for up to two years) |
| | 0.10 ppb (supply closed) |
| 1,2-Dichloropropane | 1.0 ppb |
| Dinoseb | 5.0 ppb |
| Carbofuran | 10.0 ppb |
| Aldicarb | 10.0 ppb |
| Oxamyl | 50.0 ppb |
| X | Call Region for Guidance |

LAND USE ACTIVITY
AND PESTICIDE
CONTAMINATION

LAND USE ACTIVITY

## 3. PESTICIDE RELATED LAND USE

The pesticide related land use mapping portion of the study provided the identification of past and current agricultural activities, golf courses, and transmission and railroad corridors within the 20 town study area. The mapped data allow for the identification of the extent and spatial distribution of these land use activities. They also provide a data base which can be periodically reviewed and compared to future land use information for the purpose of tracking changes and monitoring potentially sensitive areas. By comparing the Agricultural Land Use overlays with the Agricultural Chemical overlay, insight can be gained regarding potential contamination sources and chemical migration.

### 3.1 DESCRIPTION OF MAPPING

#### 1985 Land Use

Aerial photograph interpretation was the primary method used in this project to determine the agricultural and other pesticide related land uses within the 20 towns being studied. The original intent was to use 1984 photographs which would be supplemented by 1984 mapped data produced by the University of Massachusetts for ground truthing. Due to the lack of a complete set of 1984 photographs for the 20 town study area, a complete set of 1985 photographs was obtained from the Bureau of Forestry.

The Agricultural Soil Conservation and Stabilization Service (ASCS) information provided some crop reports and aerial photographs for ground truthing. This information was limited, however, in the coverage of the area and in the distinction between certain types of crops. The Franklin County ASCS, for example, had acquired information on mixed vegetables (root crops, fruits and vegetables) as well as the primary crops in the program, such as corn. Unfortunately, very little of the mixed vegetables were located in the areas with available photography. In addition, neither Hampshire nor Hampden County ASCS offices had included mixed vegetables in their surveys. Without some way to identify the photo signature of individual vegetable and fruit crops, the specific crops could not be separated during the interpretation of the photos.

One additional problem came to light in the course of the interpretation of the 1985 photos. Over 70 percent of the photos were taken in mid- to late September. This resulted in a substantial increase in the amount of tilled land, as compared to specific crop types. In particular the September photos included the middle and eastern portions of the study area, which covered the intensely cultivated central region of the Connecticut River Valley including Hadley, eastern Hatfield and Whately, and southwestern Sunderland. Table 3-16 lists the dates of aerial photography for each town in the study area.

#### 1972 Land Use

The 1972 photo-interpretation effort ran into a set of problems similar to those encountered for 1985. Although the majority of the 1972 photographs were taken in July, about 10 percent were taken in October of the same year. There was also a similar lack of ground truthing, as the 1985 material had

LAND USE ACTIVITY

been intended to provide the necessary grounds for comparison. Consequently, the photo signatures for the individual crop types could not be established.

In addition to the lack of ground truthing, the clarity of the '72 photography was considerably less than that found in '85. This was due, in part, to the poorer quality of the original 1972 photography, its overall age, the degradation of some of the materials, and the lack of chlorophyll sensitive infra-red or true color film. Agricultural land which was obviously under cultivation, as compared to pasture, but which could not be distinguished as individual crops, was frequently classified as Tilled.

### 3.1.1 Photo Interpretation

<u>Land Use Classifications</u>

The primary classifications for land uses were: Corn, Pasture, Tilled, Harvested Grasses, Tobacco, Mixed Vegetables, Golf Courses, and Nurseries (These pesticide-related land uses are also referred to as "agricultural," "crop" land, or as "farmed" area in this report). Transmission line corridors are also noted on the land use overlays for each year. However, delineation of acreages dedicated to this use was not possible with the available data.

<u>Corn</u> includes all types of corn crops. Sweet corn could not be distinguished from field or indian corn and it is unlikely that, without special narrow band scanners, this separation could be made even with proper ground truthing.

Pasture and Harvested Grasses are crop types that cover a wide variety of agricultural activities. <u>Pasture</u> includes cattle grazing areas, recent oldfields and hay land. <u>Harvested Grasses</u> includes crops such as oats, barley, winter wheat and sod, depending on the time of year. A third category, Hay Land, was considered for an additional crop type. The photo signatures for hay land varied enough, however, that they frequently overlapped pasture and grass crops depending on the intensity of the land management, how recently the land had been hayed and whether or not the parcel was also used as pasture land. The distinction was made, therefore, between Harvested Grasses and Pasture. Harvested Grasses were determined based on high levels of growth (intense red color indicating high level of chlorophyll), and intensive management, (indicated by sharp edges to the field, the presence of tractor marks and drying hay or hay bales in the fields). Pasture, on the other hand, had lower levels of chlorophyll and little or no evidence of land management.

<u>Tilled</u> land was determined based on the lack of chlorophyll and the texture of the land.

<u>Tobacco</u> was identified based on the presence of the shade netting of the pole systems.

<u>Orchards</u> were considered to be those areas where the crop trees were planted at spacings appropriate for mature fruit trees.

LAND USE ACTIVITY

Nursery areas included both greenhouses and tightly packed areas of trees or shrubs.

Golf Courses could be identified by the shape of the fairways, the chlorophyll in the Greens and their designations on the USGS base maps.

## 3.2 1972 PESTICIDE-RELATED LAND USE

The 1972 agricultural land use practices in the 20 Connecticut River Valley towns mapped in this study indicate a major commitment of land resources to farming (this also includes golf courses, however, that represents only 2 percent of the total). Despite the large forested ridges found in this area, approximately 25 percent, or 84,964 acres of the total land within the 20 town study area was actively farmed. Within the study area, the towns of Hadley and Hatfield contained the largest portion of crop land, with 59 and 47 percent of their respective land areas dedicated to agriculture. At the low end, the towns of Montague, Belchertown and Granby had 15 percent or less of their land area farmed. Table 3-2 identifies the total acreage of land used for the classifications described above (See Section 3.1.1) for each of the 20 towns in the study area.

The major portion (45 percent) of the pesticide-related land uses in 1972 was identified as Tilled. (Table 3-3 lists acreages for each of the 1972 land use classifications mapped in this study for each town.) Considering that 90 percent of the photographs were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (Mixed Vegetables) without chlorophyll sensitive film.

The lack of chlorophyll information also led to the elimination of the Harvested Grasses crop designation, as compared to 1985. This category required distinctions based on growth rates of these grasses, i.e. chlorophyll levels, and texture and grayness alone were not sufficient. Most of the acreage which should have been considered Harvested Grasses would have been a cultivated type of land use and probably ended up classified as Tilled. The rest would have come under the Pasture category.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and the lack of chlorophyll information. These included Pasture, Harvested Grasses, Tilled, and Mixed Vegetables. It is important to note, however, that the difficulties in separating these land use types did not also lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide-related land use types, corn is the most common crop and is grown on about 19 percent of the total area committed to agriculture. Tobacco accounted for 4 percent of the total, with Golf Courses, Orchards and Nurseries having 2, 1 and less than 1 percents, respectively.

Three crop types, Corn, Pasture, and Tilled, were distributed fairly evenly across the 20 town region. Their level of intensity reflected the overall level of agricultural activity in any given area.

Two crops, Mixed Vegetables and Tobacco, appeared to be clumped. Mixed Vegetables were grown primarily in the central portion of the study area with some acreage scattered in the southern end of the study area in Westfield, Agawam and Southwick. Tobacco was also strongly represented in the central region but was equally strong in the south.

Golf Courses were just the opposite of Mixed Vegetables. They were fairly well represented in all areas, proportionate to the overall level of agriculture, except in the central portion of the study area where they were found only on the eastern edge of Amherst.

Orchards and Nurseries were not well enough represented to show any strong patterns.

## 3.3 1985 PESTICIDE-RELATED LAND USE

By 1985, land use in the study area had shifted considerably. At that time, only 15 percent of the overall land in the 20 town region remained committed to agriculture. The total area of farmland was down to 50,735 acres: a drop of 34,229 acres or 40 percent from the 1972 total.

Hadley still had the highest percent of its land in farming, but its total had dropped from 59 percent (1972) to 39 percent. The percentage of land committed to agriculture in Hatfield dropped from 47 to 18 percent in the same period. Deerfield now contained the second highest proportion of agricultural activity with 26 percent of its land dedicated to that use. The most substantial change occurred in Westfield where land in agriculture dropped from 18 percent of the town's land area in 1972 to only 4 percent in 1985.

Within the overall study area, the Tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. It is still inflated, however, over the normal mid-summer conditions because of the late September photography. The land use classifications most likely to be affected by the September photography include Corn, Harvested Grasses, and Mixed Vegetables; all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year. Table 3-4 provides land use acreages for each of the towns in the study area for the year 1985.

The overall 1985 land use delineation is, however, far more accurate and precise than that made for 1972. Harvested Grasses is the major agriculture type and represented about 30 percent of the land area mapped in this study. This area may, however, include winter wheat due to the end of season photography date. Corn is the next most intense crop with 24 percent of the mapped area dedicated to its production. Pasture and Tilled land represented only 16 and 14 percent of the mapped area, respectively. Mixed Vegetables, Golf Courses, Orchards, Tobacco, and Nurseries required a

minimal proportion of the land with 9, 4, 2, 2 and less than 1 percents, respectively.

Over the entire 20 town area, four crop types, Corn, Pasture, Tilled and Harvested Grasses were distributed fairly evenly. Their level of intensity reflected the overall level of agricultural activity in any given area.

Two crops, Mixed Vegetables and Tobacco, appeared to be clumped. Mixed Vegetables were grown primarily in the central region with some acreage scattered in the southern end of the region in Westfield, Agawam and Southwick. Tobacco is also strongly clumped. However, unlike the 1972 condition, it is strongly represented in the south but almost absent in the central region.

Golf Courses were the opposite of Mixed Vegetables. They were fairly well represented in all areas, proportionate to the overall level of agriculture, except in the central region, where they were found only on the eastern edge in Amherst.

Orchards had increased their relative representation in the study area, particularly in a belt to the south of the central region from Easthampton to Belchertown.

Nurseries were not well enough represented to show any strong patterns.

## 3.4 CONCLUSIONS

One of the primary purposes of this project was to map land use activities which are known to actively use agricultural chemicals. The most apparent trend to be noted from this effort is the overall loss in agricultural land. Between 1972 and 1985 this 20 town area saw a reduction in the area of its land committed to agricultural production of over 34,000 acres or 40 percent. While the total land area dedicated to farming has decreased, however, the proportional importance of the specific land uses changed very little in that 13 year period. For example, while the total area planted in corn decreased from 17,964 acres in 1972 to 12,046 acres in 1985, this represents only a difference of 2 percentage points between the proportion of the total area required for this crop in the two years mapped. Most of the changes in proportional importance, other than those attributable to the quality or the timing of the photography, are not statistically significant.

The one exception to this trend is the reduction in the area of land dedicated to Tobacco production. The area dedicated to Tobacco, which decreased by 3234 acres from 1972, to 794 acres in 1985 (75 percent), was the largest drop of all crop types. In addition, the remaining Tobacco land use was almost entirely concentrated in the southwestern corner of the study area, with the towns of Southwick and Westfield retaining 552 of the remaining total of 794 acres.

TABLE 3-1

DISTRIBUTION OF 1985
AERIAL PHOTOGRAPHS BY DATE

| TOWN | 7/24/85 | 9/14/85 | 9/29/85 |
|---|---|---|---|
| Agawam | 1/2 | 1/2 | |
| Amherst | | All | |
| Belchertown | | | All |
| Bernardston | | All | |
| Deerfield | | All | |
| Easthampton | 1/2 | 1/2 | |
| Gill | | All | |
| Granby | | All | |
| Greenfield | | All | |
| Hadley | | All | |
| Hatfield | | All | |
| Montague | | All | |
| Northampton | 1/3 | 2/3 | |
| Northfield | | 2/3 | 1/3 |
| South Hadley | | All | |
| Southampton | All | | |
| Southwick | All | | |
| Sunderland | | All | |
| Westfield | All | | |
| Whatley | 1/3 | 2/3 | |

CONTAMINATION

# 4. WATER SUPPLIES AND PESTICIDE CONTAMINATION

## 4.1 DESCRIPTION OF STUDY

The purpose of this portion of the study was to determine the extent of known agricultural chemical contamination and the proximity of this contamination to water supplies. Two map overlays were developed for each community; one showing the locations of contaminated wells (Agricultural Chemical Contamination overlay) and one showing public water distribution systems (Water Supply overlay). The agricultural chemical contamination overlay can be combined with the pesticide related Agriculture Land Use overlay to indicate potential sources for the contamination. With this knowledge, recommendations can be made for future sampling programs to provide early detection of contamination. This study did not include detailed analyses of water sources such as aquifers nor did it cover migration analysis for the chemicals of interest. It should be noted that if a well is shown as contaminated and adjacent ones are not shown as contaminated, it may mean they were not sampled. <u>"No Result" does not imply "free of pesticides</u>."

### 4.1.1 AGRICULTURAL CHEMICAL CONTAMINATION OVERLAYS

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). Within the 20 town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. Table 4-1 lists the sample locations with the sample results. The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture.

The positive results were shown on the overlays as either a light character or a dark character depending on whether or not the concentration measured was over the Massachusetts Interim Drinking Water Guidelines (IDWG). The dark characters represent locations where the concentrations found were over the guidelines. The light characters represent locations where the concentrations were less than or equal to the IDWG **or where the concentrations were at one time over the IDWG but on subsequent sampling were found to be less than the IDWG or not detected at all.** Table 2-4 lists the IDWG for the seven agricultural chemicals. The locations with positive results are labeled with a map number and the well depth, if applicable or available. The map numbers for the locations with positive results are listed on Table 4-2 and located on the agricultural chemical overlays.

### 4.1.2 PUBLIC WATER SUPPLY OVERLAYS

The public water supply overlays were developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of goundwater and surface waters for both community and non-community supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlays also show the distribution systems for the public water supplies delineating

CONTAMINATION

service mains by size category and showing potential system interconnections. Areas served by private wells may be inferred from the system maps.

## 4.2 GROUNDWATER SUPPLY

There are several aquifers underlying the study area which supply groundwater for potable water uses. In the lowland alluvium, which overlies thick areas near the rivers, there are shallow wells in the recent sequences of lacustrine deposits. These sand and gravel deposits are located in the flood plain and lower terraces adjacent to the Connecticut River. The main aquifer which sustains the majority of municipal supply wells generally consists of unconsolidated deposits of sand and gravel occurring under thick deposits of clay, silt, and fine sand. Underneath this confined aquifer is another aquifer that consists of fractured sedimentary rock. The yield of groundwater from the sand and gravel aquifer is the highest among the three aquifers. In the uplands the only aquifer through most of the area consists of fractured metamorphic rock. The yield from this aquifer is generally less than the lowland aquifers.

Precipitation is the main source of recharge for all of the aquifers in the study area. The natural flow of groundwater is from the uplands towards the rivers in the lowlands. There can be some localized flow of water from the rivers to the shallow aquifers due to drawdown from pumping operations.

## 4.3 Water Quality Results

Table 4-4 lists the results of the sampling program for the 20 towns within the scope of this study. The table shows that of the 358 sample sites, about half were in Whately. Granby had the next highest proportion of sample sites, followed by Sunderland and Southwick. Two towns, Gill and Northfield, did not have any sample sites.

The chemical most sampled for was Ethylene Dibromide followed by 1,2-Dichloropropane and Aldicarb.

The chemical having the most frequent positive results was 1,2-Dichloropropane, followed by Ethylene Dibromide and Aldicarb. The majority of 1,2-Dichloropropane was found in Whately and Southwick. Table 2-2 shows that 1,2-Dichloropropane was recommended for mixed vegetables, berries, and potatoes in 1972 and mixed vegetables, nursery crops, and tree fruit in 1985. It has also been used on tobacco. This corresponds to the crop patterns shown on the agricultural land use overlays which show mixed vegetables and tobacco grown in the central portion (Whately, Sunderland, and Hadley) and in the southern end, including Southwick. Ethylene Dibromide also follows this pattern. Ethylene Dibromide was recommended for tobacco in 1972 and was not recommended in 1985. This correlation is not surprising, since the original intent of the sampling program was to determine pesticide contamination in and around tobacco and potato fields (1985 Summary Report: Interagency Pesticide Monitoring Program).

The community with the highest number of contaminated wells is Whately, with over half of the sample sites having a positive result for one or more agricultural chemical. Forty-two sites had a positive result for more than

one agricultural chemical. As a result of this contamination being found in private wells, the public water supply in Whately has been expanded to the majority of areas where positive results have occurred. One-third of the cost of the system was paid for by the Commonwealth.

The majority of testing and positive results occurred in the lowlands near the river. The majority of wells in this area are relatively shallow (less than 30 feet). Hydrogeologic systems are dynamic. Therefore, a reported positive test result indicates that at a certain time and point, pesticides in the concentration recorded were determined to be present. It also means that adjacent wells (which may be finished at different depths, tap different aquifers, be closer to or further away from the source of contamination) may test differently. A further note: only positive test results are recorded. Because no result is given for a particular well or location, it should not be inferred that the site is free from contamination. It may simply be that the site was never tested.

For example, not all of the contaminated wells in Whately were shallow aquifer wells. Some of the contaminated wells were taking water from deeper aquifers. This indicates that the deeper aquifer is contaminated, the well is not sealed properly, or the information on well depth is incorrect. These contaminated deep wells should be further examined because if the contamination is a result of the well not being properly sealed, then the well may in itself be contaminating the lower aquifer.

The availability of public water in the 20 town study area varies. Table 4-5 shows the approximate percentage of each town's population that receives public water. The table also indicates the primary source of water, either ground or surface supply. Where the table indicates both, the town receives a significant percentage from both types of supplies.

Eighteen of the towns have had at least a portion of their public water supplies tested for at least one of the seven agricultural chemicals. Eight towns have found some contamination in their public water supplies. One well in Deerfield, belonging to the South Deerfield Water District, and four wells in Southwick, belonging to West Springfield, have been closed because of Ethylene Dibromide contamination.

## 4.4 Conclusions

The majority of agricultural chemical contamination found was in the lowlands of the Connecticut River Valley where heavy agricultural activity occurs. Contamination was also found in areas of Southwick, Westfield, Granby, Deerfield, and the uplands of Whately.

Contamination was generally found in shallow wells near active farming. There was a correlation between the chemicals found in the wells and the chemicals recommended for the crop type grown in fields near the contaminated wells. There were also some deep wells that showed contamination. Contamination of these wells may not be from nearby fields but from more distant area(s) or the wells may not be properly sealed.

CONTAMINATION

TABLE 4-1
BASELINE SAMPLE LOCATIONS
AGRICULTURAL CHEMICAL CONTAMINATION STUDY

| MAP# | WELL DEPTH (ft) | STATUS | LAB | COMMUNITY | EDB-85 (ppb) | EDB-84 (ppb) | 1-2-D (ppb) | ALD-86 (ppb) | ALD-85 (ppb) | ALD-84 (ppb) | ALD-83 (ppb) | CARBOFURAN (ppb) | OXAMYL (ppb) | ALACHLOR (ppb) | DINOSEB (ppb) | F | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | 1 | Agawam | ND | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0080 | N | 1 | Agawam | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0100 | N | 1 | Agawam | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 1000 | N | 1 | Agawam | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Agawam | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Agawam | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Agawam | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Agawam | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Agawam | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Agawam | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Agawam | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Agawam | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Agawam | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Agawam | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Agawam | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Agawam | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 1 | 0030 | P | 1 | Amherst | ND | ND | 0.04 | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A--008-303A |
| | 0035 | N | 1 | Amherst | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0023 | N | 1 | Amherst | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0020 | N | 1 | Amherst | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0020 | N | 1 | Amherst | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0022 | N | 1 | Amherst | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Amherst | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | Amherst Wtr Div. water |
| | 0100 | N | 1 | Belchertown | -- | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | | |
| | | N | 1 | Belchertown | -- | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | | Public Water? |
| | 0078 | N | 1 | Bernardston | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-029-202A |
| | 0028 | N | 1 | Bernardston | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-029-201A |
| | | N | 1 | Deerfield | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 2 | | P | 1 | Deerfield | ND | ND | 0.17 | -- | -- | -- | -- | -- | -- | -- | -- | | S.Deerfield Wtr Dist water |
| 3 | | N | 1 | Deerfield | ND | 0.15 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | Public water '85? |
| 4 | 0054 | P | 1 | Deerfield | ND | ND | 0.49 | -- | -- | -- | 1.30 | -- | -- | -- | -- | | DEQE# 11A-074-303A |
| | 0040 | N | 1 | Deerfield | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0047 | N | 1 | Deerfield | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0035 | N | 1 | Deerfield | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0040 | N | 1 | Deerfield | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0400 | N | 1 | Deerfield | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 5 | 0044 | D | 1 | Deerfield | -- | 7.40 | -- | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-074-303H |
| | >100 | N | 1 | Easthampton | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-087-202A |
| 6 | >100 | P | 1 | Easthampton | ND | ND | 0.03 | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-087-301A |
| 7 | 0140 | P | 1 | Easthampton | ND | ND | 0.04 | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-087-300A |
| | >100 | N | 1 | Easthampton | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-087-201A |
| | | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 8 | | D | 1 | Granby | -- | -- | -- | -- | 19.8 | 27.0 | -- | ND | ND | ND | ND | | With Resample |
| | | N | 1 | Granby | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0050 | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0082 | N | 1 | Granby | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |

TABLE 4-1
BASELINE SAMPLE LOCATIONS
AGRICULTURAL CHEMICAL CONTAMINATION STUDY

| MAP# | WELL DEPTH (ft) | STATUS | LAB | COMMUNITY | EDB-85 (ppb) | EDB-84 (ppb) | 1-2-D (ppb) | ALD-86 (ppb) | ALD-85 (ppb) | ALD-84 (ppb) | ALD-83 (ppb) | CARBOFURAN (ppb) | OXAMYL (ppb) | ALACHLOR (ppb) | DINOSEB (ppb) | F | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0030 | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0065 | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0014 | N | 1 | Granby | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0012 | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0020 | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 9 | 0025 | O | 1 | Granby | -- | -- | -- | -- | 21.7 | 12.0 | -- | ND | ND | ND | ND | | R-CARBIDE, With Resample |
| 10 | 0020 | P | 1 | Granby | -- | -- | -- | -- | 5.00 | 5.00 | -- | ND | ND | ND | ND | | |
| | 0020 | N | 1 | Granby | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0020 | N | 1 | Granby | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0030 | N | 1 | Granby | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0018 | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0007 | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0090 | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0098 | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0100 | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0090 | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Granby | -- | -- | -- | -- | ND | -- | -- | ND | ND | ND | ND | | |
| | | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Granby | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Greenfield | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-114-204A |
| | 0124 | N | 1 | Greenfield | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-114-201A |
| | 0084 | N | 1 | Greenfield | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-114-202A |
| | 0083 | N | 1 | Greenfield | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-114-203A |
| | | N | 1 | Hadley | -- | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | | |
| | 0075 | N | 1 | Hadley | -- | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | | DEQE# 11A-117-304A |
| | 0021 | N | 1 | Hadley | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0075 | N | 1 | Hadley | ND | ND | ND | -- | ND | -- | ND | ND | ND | ND | ND | | DEQE# 11A-117-301A |
| | 0075 | N | 1 | Hadley | ND | ND | ND | -- | ND | -- | ND | ND | ND | ND | ND | | DEQE# 11A-117-300A |
| | | N | 1 | Hadley | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0032 | N | 1 | Hadley | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Hatfield | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Hatfield | ND | -- | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 11 | 0180 | P | 1 | Hatfield | ND | ND | 0.05 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0180 | N | 1 | Hatfield | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | Y | |
| 12 | 0190 | P | 1 | Hatfield | ND | ND | 0.41 | -- | -- | -- | -- | -- | -- | -- | -- | | With Resample |
| 13 | 0100 | O | 1 | Hatfield | ND | 0.16 | 3.20 | -- | -- | -- | -- | -- | -- | -- | -- | Y | |
| 14 | | P | 1 | Hatfield | ND | ND | 0.41 | -- | -- | -- | -- | -- | -- | -- | -- | | Spring fed |
| | 0013 | N | 1 | Hatfield | -- | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | | |
| | | N | 1 | Hatfield | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0022 | N | 1 | Hatfield | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 15 | | P | 1 | Hatfield | ND | ND | 0.03 | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-127-300B |

TABLE 4-1
BASELINE SAMPLE LOCATIONS
AGRICULTURAL CHEMICAL CONTAMINATION STUDY

| MAP# | WELL DEPTH (ft) | STATUS | LAB | COMMUNITY | EDB-85 (ppb) | EDB-84 (ppb) | 1-2-D (ppb) | ALD-86 (ppb) | ALD-85 (ppb) | ALD-84 (ppb) | ALD-83 (ppb) | CARBOFURAN (ppb) | OXAMYL (ppb) | ALACHLOR (ppb) | DINOSEB (ppb) | F | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0170 | N | 1 | Hatfield | ND | ND | ND | -- | ND | -- | ND | ND | ND | ND | ND | | DEQE# 11A-127-302A |
| | 0125 | N | 1 | Hatfield | ND | ND | ND | -- | ND | -- | ND | ND | ND | ND | ND | | DEQE# 11A-127-201A |
| 16 | 0110 | P | 1 | Montague | ND | ND | 0.11 | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-192-302A |
| | 0025 | N | 1 | Montague | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0030 | N | 1 | Montague | ND | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 17 | | P | 1 | Montague | ND | ND | 0.04 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0014 | N | 1 | Montague | ND | ND | ND | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0024 | N | 1 | Montague | ND | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 18 | 0014 | N | 1 | Montague | -- | -- | -- | -- | ND | 5.00 | -- | ND | ND | ND | ND | | |
| | | N | 1 | Montague | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | | N | 1 | Montague | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | Turners Falls F.D. water |
| | 0085 | N | 1 | Northampton | -- | -- | -- | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-214-200A |
| | | N | 1 | Northampton | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | | N | 1 | Northampton | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0088 | N | 1 | Northampton | -- | -- | -- | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-214-203A |
| 19 | 0040 | P | 1 | Northampton | -- | -- | -- | -- | -- | 5.00 | -- | -- | -- | -- | -- | | |
| | 0015 | N | 1 | South Hadley | -- | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | | |
| | 0098 | N | 1 | South Hadley | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-275-302A |
| | | N | 1 | South Hadley | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | S. Hadley F.D.#2 water |
| | 0108 | N | 1 | South Hadley | -- | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | | |
| 21 | 0160 | P | 1 | Southampton | ND | ND | 0.10 | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-276-300A |
| 22 | 0160 | P | 1 | Southampton | ND | ND | 0.04 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Southampton | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | Holyoke Water Dept. water |
| 23 | 0100 | D | 1 | Southwick | 3.80 | 4.80 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Southwick | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 24 | 0112 | P | 1 | Southwick | ND | ND | 0.12 | -- | -- | -- | -- | -- | -- | -- | -- | Y | DEQE# 11A--279-301A |
| 25 | 0112 | P | 1 | Southwick | 0.10 | ND | 0.24 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Southwick | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Southwick | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0110 | N | 1 | Southwick | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 26 | 0150 | P | 1 | Southwick | ND | ND | 0.03 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 27 | 0030 | P | 1 | Southwick | ND | ND | 0.15 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Southwick | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 28 | | P | 2 | Southwick | ND | -- | 1.00 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 29 | | D | 1 | Southwick | ND | ND | 2.90 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 30 | | D | 2 | Southwick | -- | -- | 4.73 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Southwick | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0030 | N | 1 | Southwick | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0030 | N | 1 | Southwick | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 31 | 0130 | D | 2 | Southwick | 1.1 | 0.73 | 0.94 | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-279-305H,Closed |
| 32 | 0127 | D | 2 | Southwick | 0.44 | 0.48 | 1.08 | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-279-302H,Closed |
| 33 | 0112 | D | 2 | Southwick | 2.35 | 1.50 | 0.43 | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-279-303H,Closed |
| 34 | | P | 2 | Southwick | 0.10 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 35 | | D | 1 | Southwick | ND | ND | 1.10 | -- | -- | -- | -- | -- | -- | -- | -- | | Field well |
| 36 | 0030 | D | 1 | Southwick | ND | ND | 7.80 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0100 | N | 1 | Southwick | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 37 | 0025 | D | 1 | Southwick | 0.24 | 0.75 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |

TABLE 4-1
BASELINE SAMPLE LOCATIONS
AGRICULTURAL CHEMICAL CONTAMINATION STUDY

| MAP# | WELL DEPTH (ft) | STATUS | LAB | COMMUNITY | EDB-85 (ppb) | EDB-84 (ppb) | 1-2-D (ppb) | ALD-86 (ppb) | ALD-85 (ppb) | ALD-84 (ppb) | ALD-83 (ppb) | CARBOFURAN (ppb) | OXAMYL (ppb) | ALACHLOR (ppb) | DINOSEB (ppb) | F | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 38 | 0025 | O | 1 | Southwick | 0.27 | 0.55 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 39 | 0130 | O | 1 | Southwick | 0.13 | 0.05 | 0.14 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 40 | 0095 | O | 1 | Southwick | ND | -- | 11.0 | -- | -- | -- | -- | -- | -- | -- | -- | | Also Has Public Water |
| | 0097 | N | 1 | Sunderland | ND | ND | ND | -- | ND | -- | ND | ND | ND | ND | ND | | DEQE# 11A-289-302A |
| | 0040 | N | 1 | Sunderland | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0200 | N | 1 | Sunderland | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0380 | N | 1 | Sunderland | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0040 | N | 1 | Sunderland | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Sunderland | -- | ND | -- | -- | -- | -- | -- | -- | -- | -- | -- | | Public water '85 |
| | 0015 | N | 1 | Sunderland | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0017 | N | 1 | Sunderland | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0020 | N | 1 | Sunderland | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Sunderland | -- | ND | -- | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 41 | 0020 | N | 1 | Sunderland | ND | ND | ND | -- | ND | 4.60 | -- | ND | ND | ND | ND | | |
| | | N | 1 | Sunderland | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | Public water |
| | | N | 1 | Sunderland | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | Public water |
| | 0030 | N | 1 | Sunderland | -- | ND | -- | -- | ND | -- | ND | ND | ND | ND | ND | | Public water |
| | | N | 1 | Sunderland | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 42 | 0032 | O | 1 | Sunderland | -- | 0.60 | -- | -- | -- | -- | -- | -- | -- | -- | -- | | Public water '85? |
| | 0028 | N | 1 | Sunderland | -- | ND | -- | -- | -- | -- | -- | -- | -- | -- | -- | | Public water '85? |
| | 0080 | N | 1 | Sunderland | ND | ND | ND | -- | ND | -- | ND | ND | ND | ND | ND | | DEQE# 11A-289-301A |
| 43 | 0022 | O | 1 | Sunderland | ND | 0.08 | 3.30 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 44 | 0022 | O | 1 | Sunderland | ND | 0.31 | 1.70 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 45 | 0020 | O | 1 | Sunderland | -- | 0.45 | -- | -- | -- | -- | -- | -- | -- | -- | -- | | Public water '85? |
| 46 | | P | 1 | Sunderland | ND | ND | 0.35 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0020 | N | 1 | Sunderland | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0024 | N | 1 | Sunderland | ND | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 47 | 0025 | P | 1 | Sunderland | -- | -- | -- | -- | 10.0 | 16.0 | -- | 1.60 | ND | ND | ND | | Public water '85? |
| | 0021 | N | 1 | Sunderland | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0015 | N | 1 | Sunderland | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0014 | N | 1 | Sunderland | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0015 | N | 1 | Sunderland | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Westfield | -- | ND | -- | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-329-308F |
| 48 | | P | 1 | Westfield | ND | ND | 0.37 | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-329-209E |
| | 0118 | N | 1 | Westfield | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-329-302E |
| | 0184 | N | 1 | Westfield | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-329-300A |
| | 0171 | N | 1 | Westfield | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-329-301A |
| 49 | 0124 | P | 1 | Westfield | ND | ND | 0.24 | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-329-304A |
| | 0121 | N | 1 | Westfield | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-329-305A |
| | 0045 | N | 1 | Westfield | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0122 | N | 1 | Westfield | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-329-303A |
| 20 | | P | 1 | Whately | ND | ND | 0.09 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 51 | | P | 1 | Whately | ND | ND | 0.04 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 52 | 0190 | N | 1 | Whately | ND | 0.28 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0210 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 53 | | O | 2 | Whately | -- | 0.11 | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 54 | | O | 1 | Whately | 0.15 | 0.02 | 0.79 | -- | -- | -- | -- | -- | -- | -- | -- | | Spring fed |

TABLE 4-1
BASELINE SAMPLE LOCATIONS
AGRICULTURAL CHEMICAL CONTAMINATION STUDY

| MAP# | WELL DEPTH (ft) | STATUS | LAB | COMMUNITY | EDB-B5 (ppb) | EDB-B4 (ppb) | 1-2-D (ppb) | ALD-B6 (ppb) | ALD-B5 (ppb) | ALD-B4 (ppb) | ALD-B3 (ppb) | CARBOFURAN (ppb) | OXAMYL (ppb) | ALACHLOR (ppb) | DINOSEB (ppb) | F | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | | P | 1 | Whately | 0.07 | ND | 0.45 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0025 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 56 | 0025 | P | 1 | Whately | ND | ND | ND | -- | 6.30 | ND | ND | ND | ND | ND | ND | Y | |
| | | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | Y | |
| 57 | | O | 1 | Whately | 3.00 | 1.80 | 27.0 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 58 | 0014 | O | 1 | Whately | 6.90 | 1.30 | 45.0 | -- | -- | -- | -- | -- | -- | -- | -- | | With Resample |
| 59 | | O | 1 | Whately | 0.93 | 0.45 | 9.00 | -- | -- | -- | -- | -- | -- | -- | -- | Y | |
| 60 | 0250 | O | 1 | Whately | 5.40 | 3.80 | 26.0 | -- | 4.92 | 34.0 | -- | ND | ND | ND | ND | Y | With Resample |
| 61 | 0020 | O | 1 | Whately | 1.00 | 1.20 | 1.90 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 62 | 0012 | O | 1 | Whately | ND | ND | 1.60 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 63 | | O | 1 | Whately | 0.25 | 1.70 | 1.60 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 64 | | P | 1 | Whately | 0.08 | ND | 0.41 | -- | -- | -- | -- | -- | -- | -- | -- | | With Resample |
| 65 | 0008 | P | 1 | Whately | ND | 0.07 | 0.22 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 66 | 0018 | P | 1 | Whately | 0.06 | 0.03 | 0.59 | -- | -- | -- | -- | -- | -- | -- | -- | | With Resample |
| | 0028 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0015 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0150 | N | 1 | Whately | ND | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 67 | 0020 | O | 1 | Whately | 0.12 | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | Y | |
| | 0015 | N | 1 | Whately | ND | ND | ND | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0020 | N | 1 | Whately | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 68 | | P | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | 3.80 | ND | ND | ND | | |
| | 0020 | N | 1 | Whately | ND | ND | ND | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0032 | N | 1 | Whately | ND | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | | 2 wells |
| | 0016 | N | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0018 | N | 1 | Whately | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0018 | N | 1 | Whately | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0013 | N | 1 | Whately | ND | ND | ND | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0018 | N | 1 | Whately | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 69 | 0004 | P | 1 | Whately | 0.03 | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | Combination of Two Labs |
| 70 | 0021 | N | 1 | Whately | ND | ND | ND | -- | ND | 37.0 | -- | ND | ND | ND | ND | Y | |
| 71 | 0022 | O | 1 | Whately | -- | -- | -- | 25.0(3) | -- | 34.0 | -- | -- | -- | -- | -- | Y | M-CARBIDE |
| 72 | | O | 1 | Whately | ND | ND | ND | 19.0(3) | 16.6 | 12.0 | -- | ND | ND | ND | ND | Y | M-CARBIDE |
| 73 | 0022 | P | 1 | Whately | -- | -- | -- | -- | 8.70 | 4.00 | -- | ND | ND | ND | ND | | |
| 74 | 0017 | P | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | 0.36 | | With Resample |
| | 0021 | N | 1 | Whately | ND | ND | ND | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | | N | 1 | Whately | -- | -- | -- | -- | ND | -- | -- | ND | ND | ND | ND | | |
| 75 | 0012 | N | 1 | Whately | ND | ND | ND | -- | ND | 2.00 | -- | ND | ND | ND | ND | | |
| | 0017 | N | 1 | Whately | ND | ND | ND | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0035 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 76 | 0018 | O | 1 | Whately | 0.03 | 0.17 | 3.20 | -- | 1.70 | 18.0 | -- | ND | ND | ND | ND | Y | N-CARBIDE |
| 77 | | P | 1 | Whately | ND | ND | 0.08 | -- | -- | -- | -- | -- | -- | -- | -- | | |

TABLE 4-1
BASELINE SAMPLE LOCATIONS
AGRICULTURAL CHEMICAL CONTAMINATION STUDY

| MAP# | WELL DEPTH (ft) | STATUS | LAB | COMMUNITY | EDB-85 (ppb) | EDB-84 (ppb) | 1-2-D (ppb) | ALD-86 (ppb) | ALD-85 (ppb) | ALD-84 (ppb) | ALD-83 (ppb) | CARBOFURAN (ppb) | OXAMYL (ppb) | ALACHLOR (ppb) | DINOSEB (ppb) | F | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 78 | | D | 1 | Whately | 0.04 | 0.28 | 3.30 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 79 | 0014 | P | 1 | Whately | 0.08 | ND | 0.08 | -- | -- | ND | -- | -- | -- | -- | -- | Y | N-CARBIDE |
| 80 | 0030 | P | 1 | Whately | ND | ND | 0.04 | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Whately | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-337-304 |
| | 0012 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0350 | N | 1 | Whately | ND | ND | ND | -- | ND | -- | ND | ND | ND | ND | ND | | DEQE# 11A-337-302A |
| | 0070 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0015 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0015 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 81 | 0015 | P | 1 | Whately | ND | ND | 0.08 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0006 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0017 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0017 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0035 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0012 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0022 | N | 1 | Whately | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0025 | N | 1 | Whately | ND | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 82 | 0014 | P | 1 | Whately | ND | ND | 0.41 | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0020 | N | 1 | Whately | ND | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0020 | N | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 83 | 0020 | N | 1 | Whately | ND | ND | ND | -- | ND | 4.00 | -- | ND | ND | ND | ND | | 2 wells |
| | 0014 | N | 1 | Whately | ND | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 84 | 0012 | P | 1 | Whately | ND | ND | ND | -- | 1.00 | ND | -- | ND | ND | ND | ND | | |
| 85 | | N | 1 | Whately | -- | -- | -- | -- | ND | 3.00 | -- | ND | ND | ND | ND | | |
| 86 | 0020 | D | 1 | Whately | -- | -- | -- | -- | 16.0 | 35.0 | 7.00 | 1.00 | ND | ND | 1.66 | Y | M-CARBIDE, With Resample |
| | 0015 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 87 | 0024 | P | 1 | Whately | 0.03 | ND | ND | -- | 1.20 | ND | -- | 2.20 | ND | ND | ND | | With Resample |
| 88 | 0014 | P | 1 | Whately | ND | ND | 0.79 | -- | -- | 5.00 | -- | -- | -- | -- | -- | | |
| | 0025 | N | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | -- | -- | -- | -- | | |
| 89 | 0028 | P | 1 | Whately | ND | 0.23 | 0.10 | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0015 | N | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 90 | 0040 | P | 1 | Whately | ND | ND | 0.12 | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 91 | 0023 | P | 1 | Whately | ND | 0.13 | 0.69 | 27.0(3) | ND | 19.0 | -- | ND | ND | ND | ND | Y | M-CARBIDE |
| 92 | 0012 | D | 1 | Whately | ND | ND | 14.0 | -- | 8.20 | ND | -- | 6.60 | ND | ND | ND | | |
| 93 | 0028 | D | 1 | Whately | ND | 0.04 | 1.80 | -- | 8.80 | 36.0 | 19.0 | 3.60 | ND | ND | ND | Y | N-CARBIDE |
| 94 | 0020 | D | 1 | Whately | 0.03 | 0.06 | 35.0 | -- | 12.9 | 5.00 | ND | 3.80 | ND | ND | ND | | |
| 95 | 0028 | D | 1 | Whately | ND | 0.06 | 0.08 | 4.00(3) | 17.9 | 75.0 | 181. | 4.70 | ND | ND | ND | Y | N-CARBIDE |
| 96 | 0025 | D | 1 | Whately | 1.20 | 1.60 | 5.30 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 97 | 0036 | D | 1 | Whately | 0.55 | 3.20 | 5.00 | 24.0(3) | 24.5 | 29.0 | -- | 1.30 | ND | ND | ND | Y | M-CARBIDE |
| 98 | 0018 | D | 1 | Whately | 1.10 | 1.50 | 12.0 | -- | ND | 2.00 | ND | ND | ND | ND | ND | Y | |
| 99 | 0028 | D | 1 | Whately | 0.15 | 0.38 | 4.70 | 37.0(3) | 44.2 | 32.0 | -- | 1.50 | ND | ND | 2.10 | Y | M-CARBIDE |
| 100 | | P | 1 | Whately | ND | ND | ND | -- | 1.50 | 3.00 | -- | ND | ND | ND | 2.10 | | With Resample |
| 101 | 0022 | P | 1 | Whately | ND | ND | 0.13 | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 102 | 0034 | P | 1 | Whately | ND | ND | 0.31 | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0011 | N | 1 | Whately | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |

TABLE 4-1
BASELINE SAMPLE LOCATIONS
AGRICULTURAL CHEMICAL CONTAMINATION STUDY

| MAP# | WELL DEPTH (ft) | STATUS | LAB | COMMUNITY | EDB-85 (ppb) | EDB-84 (ppb) | 1-2-D (ppb) | ALD-86 (ppb) | ALD-85 (ppb) | ALD-84 (ppb) | ALD-83 (ppb) | CARBOFURAN (ppb) | OXAMYL (ppb) | ALACHLOR (ppb) | DINOSEB (ppb) | F | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | 1 | Whately | ND | ND | ND | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | | N | 1 | Whately | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0014 | N | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0016 | N | 1 | Whately | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | | N | 1 | Whately | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0013 | N | 1 | Whately | -- | -- | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 103 | 0011 | N | 1 | Whately | -- | -- | -- | -- | ND | 1.00 | -- | ND | ND | ND | ND | | |
| 104 | | N | 1 | Whately | ND | 0.21 | ND | -- | ND | ND | -- | ND | ND | ND | ND | Y | |
| | 0011 | N | 1 | Whately | ND | ND | ND | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 105 | 0009 | N | 1 | Whately | ND | 0.18 | ND | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0013 | N | 1 | Whately | ND | ND | ND | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0012 | N | 1 | Whately | ND | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0020 | N | 1 | Whately | ND | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 106 | 0013 | P | 1 | Whately | ND | ND | ND | -- | 1.20 | ND | -- | ND | ND | ND | ND | | |
| | 0015 | N | 1 | Whately | ND | ND | ND | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 107 | 0017 | D | 1 | Whately | ND | ND | 1.10 | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 108 | 0017 | D | 1 | Whately | -- | -- | -- | -- | 10.8 | 8.00 | -- | ND | ND | ND | ND | | |
| 109 | 0016 | P | 1 | Whately | -- | -- | -- | -- | 3.00 | ND | -- | ND | ND | ND | ND | | |
| | | N | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 110 | | P | 1 | Whately | ND | ND | ND | -- | 5.30 | 4.00 | -- | ND | ND | ND | ND | | |
| 111 | | P | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | 2.10 | | |
| | | N | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 112 | | P | 1 | Whately | ND | ND | ND | -- | ND | ND | -- | ND | ND | ND | 1.49 | | |
| 113 | 0020 | N | 1 | Whately | -- | -- | -- | -- | ND | 2.00 | -- | ND | ND | ND | ND | | |
| 114 | | P | 1 | Whately | -- | -- | -- | -- | 3.90 | 6.00 | -- | ND | ND | 0.20 | 1.50 | | With Resample |
| 115 | | D | 1 | Whately | -- | -- | -- | -- | -- | 18.0 | -- | -- | -- | ND | ND | Y | N-CARBIDE |
| 116 | | D | 1 | Whately | ND | ND | ND | -- | 9.00 | 11.0 | -- | 36.6 | ND | ND | ND | Y | N-CARBIDE |
| 117 | 0026 | D | 1 | Whately | -- | -- | -- | -- | 4.30 | 15.0 | -- | ND | ND | ND | 36.7 | | R-CARBIDE,With Resample |
| 118 | | P | 1 | Whately | -- | -- | -- | -- | 3.80 | 5.00 | -- | ND | ND | ND | ND | | |
| 119 | | P | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | 1.00 | ND | ND | | With Resample |
| | 0035 | N | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0012 | N | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 120 | | P | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | 1.40 | ND | ND | ND | | |
| | | N | 1 | Whately | ND | ND | ND | -- | ND | -- | -- | ND | ND | ND | ND | | |
| | | N | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0012 | N | 1 | Whately | ND | ND | ND | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 50 | | P | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | 8.63 | | With Resample |
| | 0024 | N | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 121 | 0006 | N | 1 | Whately | ND | 1.50 | ND | -- | ND | ND | -- | ND | ND | ND | ND | | Well #1, Cellar |
| | 0014 | N | 1 | Whately | ND | -- | ND | -- | -- | -- | -- | -- | -- | -- | -- | | Well #2, Garage |
| | 0030 | N | 1 | Whately | ND | ND | ND | -- | ND | ND | -- | ND | ND | ND | ND | | |
| | 0028 | N | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 122 | 0020 | D | 1 | Whately | ND | ND | 1.20 | -- | 18.1 | 5.00 | -- | ND | ND | ND | ND | | With Resample |
| 123 | 0015 | D | 1 | Whately | 1.50 | 1.30 | 2.80 | -- | ND | 5.00 | -- | ND | ND | ND | ND | | |
| 124 | 0700 | D | 1 | Whately | 0.10 | 4.90 | 0.26 | -- | 45.6 | 4.90 | -- | ND | ND | ND | ND | Y | Well #1 |
| 125 | 0700 | P | 1 | Whately | 0.07 | ND | 0.24 | -- | -- | -- | -- | -- | -- | -- | -- | Y | Well #2, With Resample |
| 126 | | P | 1 | Whately | -- | -- | -- | -- | 2.70 | 3.00 | -- | ND | ND | ND | 0.59 | | With Resample |

TABLE 4-1
BASELINE SAMPLE LOCATIONS
AGRICULTURAL CHEMICAL CONTAMINATION STUDY

| MAP# | WELL DEPTH (ft) | STATUS | LAB | COMMUNITY | EDB-85 (ppb) | EDB-84 (ppb) | 1-2-D (ppb) | ALD-86 (ppb) | ALD-85 (ppb) | ALD-84 (ppb) | ALD-83 (ppb) | CARBOFURAN (ppb) | OXAMYL (ppb) | ALACHLOR (ppb) | DINOSEB (ppb) | F | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0260 | N | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 127 | | P | 1 | Whately | -- | -- | -- | -- | 2.96 | 5.00 | -- | ND | ND | ND | ND | | |
| 128 | | P | 1 | Whately | ND | ND | ND | -- | 4.60 | 3.00 | -- | 2.24 | ND | ND | ND | | |
| | | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 130 | | O | 1 | Whately | 1.40 | ND | 51.0 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 129 | 0040 | P | 1 | Whately | ND | ND | 0.09 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 131 | | O | 1 | Whately | 0.12 | 0.13 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 132 | 0015 | P | 1 | Whately | 0.05 | 0.02 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | Well #2 |
| | 0500 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | Well #1 |
| 133 | | O | 1 | Whately | 0.12 | 0.08 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0009 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 134 | 0020 | P | 1 | Whately | ND | ND | 0.06 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 135 | 0012 | P | 1 | Whately | ND | ND | 0.10 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 136 | 0014 | O | 1 | Whately | 0.05 | ND | 2.70 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 137 | | O | 1 | Whately | 0.10 | 0.06 | 20.0 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 138 | 0025 | P | 1 | Whately | ND | ND | 0.34 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 139 | 0020 | O | 1 | Whately | 0.10 | 2.60 | 26.0 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| | 0012 | N | 1 | Whately | ND | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | | |
| | 0020 | N | 1 | Whately | ND | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 140 | 0020 | P | 1 | Whately | ND | ND | 0.06 | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 141 | 0020 | P | 1 | Whately | ND | ND | 0.05 | -- | 4.20 | 4.00 | -- | 3.00 | ND | ND | ND | | |
| 142 | | P | 1 | Whately | ND | ND | 0.11 | -- | 2.20 | 3.00 | -- | 6.30 | ND | 0.42 | ND | | |
| 143 | 0022 | P | 1 | Whately | ND | ND | 0.10 | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 144 | | P | 1 | Whately | ND | ND | 0.22 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 145 | | O | 2 | Whately | 0.26 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | Y | 5\86 |
| | 0158 | N | 1 | Whately | ND | ND | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 146 | 0140 | O | 1 | Whately | 0.10 | 0.24 | 2.30 | -- | -- | -- | -- | -- | -- | -- | -- | Y | |

TABLE 4-2
LIST OF POSITIVE RESULTS
FOR AGRICULTURAL CHEMICAL OVERLAYS

| MAP# | WELL DEPTH (ft) | STATUS | LAB | COMMUNITY | EDB-85 (ppb) | EDB-84 (ppb) | 1-2-D (ppb) | ALD-86 (ppb) | ALD-85 (ppb) | ALD-84 (ppb) | ALD-83 (ppb) | CARBOFURAN (ppb) | OXAMYL (ppb) | ALACHLOR (ppb) | DINOSEB (ppb) | F | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0030 | P | 1 | Amherst | ND | ND | 0.04 | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-008-303A |
| 2 | | P | 1 | Deerfield | ND | ND | 0.17 | -- | -- | -- | -- | -- | -- | -- | -- | | S.Deerfield Wtr Dist wate |
| 3 | | N | 1 | Deerfield | ND | 0.15 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | Public Water '85? |
| 4 | 0054 | P | 1 | Deerfield | ND | ND | 0.49 | -- | -- | -- | 1.30 | -- | -- | -- | -- | | DEQE# 11A-074-303A |
| 5 | 0044 | O | 1 | Deerfield | -- | 7.40 | -- | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-074-303H |
| 6 | >100 | P | 1 | Easthampton | ND | ND | 0.03 | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-087-301A |
| 7 | 0140 | P | 1 | Easthampton | ND | ND | 0.04 | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-087-300A |
| 8 | | O | 1 | Granby | -- | -- | -- | -- | 19.8 | 27.0 | -- | ND | ND | ND | ND | | |
| 9 | 0025 | O | 1 | Granby | -- | -- | -- | -- | 21.7 | 12.0 | -- | ND | ND | ND | ND | | R-CARBIDE |
| 10 | 0020 | P | 1 | Granby | -- | -- | -- | -- | 5.00 | 5.00 | -- | ND | ND | ND | ND | | |
| 11 | 0180 | P | 1 | Hatfield | ND | ND | 0.05 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 12 | 0190 | P | 1 | Hatfield | ND | ND | 0.18 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 13 | 0100 | O | 1 | Hatfield | ND | 0.16 | 3.20 | -- | -- | -- | -- | -- | -- | -- | -- | Y | |
| 14 | | P | 1 | Hatfield | ND | ND | 0.41 | -- | -- | -- | -- | -- | -- | -- | -- | | Spring fed |
| 15 | | P | 1 | Hatfield | ND | ND | 0.03 | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-127-300B |
| 16 | 0110 | P | 1 | Montague | ND | ND | 0.11 | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-192-300A |
| 17 | | P | 1 | Montague | ND | ND | 0.04 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 18 | 0014 | N | 1 | Montague | -- | -- | -- | -- | ND | 5.00 | -- | ND | ND | ND | ND | | |
| 19 | 0040 | P | 1 | Northampton | -- | -- | -- | -- | -- | 5.00 | -- | -- | -- | -- | -- | | |
| 20 | | P | 1 | Whately | ND | ND | 0.09 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 21 | 0160 | P | 1 | Southampton | ND | ND | 0.10 | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-276-300A |
| 22 | 0160 | P | 1 | Southampton | ND | ND | 0.04 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 23 | 0100 | O | 1 | Southwick | 3.80 | 4.80 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 24 | 0112 | P | 1 | Southwick | ND | ND | 0.12 | -- | -- | -- | -- | -- | -- | -- | -- | Y | DEQE# 11A-279-301A |
| 25 | 0112 | P | 1 | Southwick | 0.10 | ND | 0.24 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 26 | 0150 | P | 1 | Southwick | ND | ND | 0.03 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 27 | 0030 | P | 1 | Southwick | ND | ND | 0.15 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 28 | | P | 2 | Southwick | ND | -- | 1.00 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 29 | | O | 1 | Southwick | ND | ND | 2.90 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 30 | | O | 2 | Southwick | -- | -- | 4.73 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 31 | 0130 | O | 2 | Southwick | 1.1 | 0.73 | 0.94 | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-279-305H,Closec |
| 32 | 0127 | O | 2 | Southwick | 0.44 | 0.48 | 1.08 | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-279-302H,Closec |
| 33 | 0112 | O | 2 | Southwick | 2.35 | 1.50 | 0.43 | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-279-303H,Closec |
| 34 | | P | 2 | Southwick | 0.10 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 35 | | O | 1 | Southwick | ND | ND | 1.10 | -- | -- | -- | -- | -- | -- | -- | -- | | Field well |
| 36 | 0030 | O | 1 | Southwick | ND | ND | 7.80 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 37 | 0025 | O | 1 | Southwick | 0.24 | 0.75 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 38 | 0025 | O | 1 | Southwick | 0.27 | 0.55 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 39 | 0130 | O | 1 | Southwick | 0.13 | 0.05 | 0.14 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 40 | 0095 | O | 1 | Southwick | ND | -- | 11.0 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 41 | 0020 | N | 1 | Sunderland | ND | ND | ND | -- | ND | 4.60 | -- | ND | ND | ND | ND | | |
| 42 | 0032 | O | 1 | Sunderland | -- | 0.60 | -- | -- | -- | -- | -- | -- | -- | -- | -- | | Public water '85? |
| 43 | 0022 | O | 1 | Sunderland | ND | 0.08 | 3.30 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 44 | 0022 | O | 1 | Sunderland | ND | 0.31 | 1.70 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 45 | 0020 | O | 1 | Sunderland | -- | 0.45 | -- | -- | -- | -- | -- | -- | -- | -- | -- | | Public water '85? |

TABLE 4-2
LIST OF POSITIVE RESULTS
FOR AGRICULTURAL CHEMICAL OVERLAYS

| MAP# | WELL DEPTH (ft) | STATUS | LAB | COMMUNITY | EDB-85 (ppb) | EDB-84 (ppb) | 1-2-D (ppb) | ALD-86 (ppb) | ALD-85 (ppb) | ALD-84 (ppb) | ALD-83 (ppb) | CARBOFURAN (ppb) | OXAMYL (ppb) | ALACHLOR (ppb) | DINOSEB (ppb) | F | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46 | | P | 1 | Sunderland | ND | ND | 0.35 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 47 | 0025 | P | 1 | Sunderland | -- | -- | -- | -- | 10.0 | 16.0 | -- | 1.60 | ND | ND | ND | | Public water '85? |
| 48 | | P | 1 | Westfield | ND | ND | 0.37 | -- | -- | -- | -- | -- | -- | -- | -- | | DEQE# 11A-329-209E |
| 49 | 0124 | P | 1 | Westfield | ND | ND | 0.24 | -- | ND | -- | -- | ND | ND | ND | ND | | DEQE# 11A-329-304A |
| 50 | | P | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | 8.63 | | |
| 51 | | P | 1 | Whately | ND | ND | 0.04 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 52 | 0190 | N | 1 | Whately | ND | 0.28 | -- | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 53 | | O | 2 | Whately | -- | 0.11 | -- | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 54 | | O | 1 | Whately | 0.15 | 0.02 | 0.79 | -- | -- | -- | -- | -- | -- | -- | -- | | Spring fed |
| 55 | | P | 1 | Whately | 0.07 | ND | 0.45 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 56 | 0025 | P | 1 | Whately | ND | ND | ND | -- | 6.30 | ND | ND | ND | ND | ND | ND | Y | |
| 57 | | O | 1 | Whately | 3.00 | 1.80 | 27.0 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 58 | 0014 | O | 1 | Whately | 6.90 | 1.30 | 45.0 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 59 | | O | 1 | Whately | 0.93 | 0.45 | 9.00 | -- | -- | -- | -- | -- | -- | -- | -- | Y | |
| 60 | 0250 | O | 1 | Whately | 5.40 | 3.80 | 26.0 | -- | 4.92 | 34.0 | -- | ND | ND | ND | ND | Y | Two Samples |
| 61 | 0020 | O | 1 | Whately | 1.00 | 1.20 | 1.90 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 62 | 0012 | O | 1 | Whately | ND | ND | 1.60 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 63 | | O | 1 | Whately | 0.25 | 1.70 | 1.60 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 64 | | P | 1 | Whately | 0.08 | ND | 0.41 | -- | -- | -- | -- | -- | -- | -- | -- | | Two Samples |
| 65 | 0008 | P | 1 | Whately | ND | 0.07 | 0.22 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 66 | 0018 | P | 1 | Whately | 0.06 | 0.03 | 0.59 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 67 | 0020 | O | 1 | Whately | 0.12 | ND | ND | -- | -- | ND | -- | -- | -- | -- | -- | Y | |
| 68 | | P | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | 3.80 | ND | ND | ND | | |
| 69 | 0004 | P | 2 | Whately | 0.03 | -- | -- | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 70 | 0021 | N | 1 | Whately | ND | ND | ND | -- | ND | 37.0 | -- | ND | ND | ND | ND | Y | |
| 71 | 0022 | O | 1 | Whately | -- | -- | -- | 25.0(3) | -- | 34.0 | -- | -- | -- | -- | -- | Y | M-CARBIDE |
| 72 | | O | 1 | Whately | ND | ND | ND | 19.0(3) | 16.6 | 12.0 | -- | ND | ND | ND | ND | Y | M-CARBIDE |
| 73 | 0022 | P | 1 | Whately | -- | -- | -- | -- | 8.70 | 4.00 | -- | ND | ND | ND | ND | | |
| 74 | 0017 | P | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | 0.36 | | |
| 75 | 0012 | N | 1 | Whately | ND | ND | ND | -- | ND | 2.00 | -- | ND | ND | ND | ND | | |
| 76 | 0018 | O | 1 | Whately | 0.03 | 0.17 | 3.20 | -- | 1.70 | 18.0 | -- | ND | ND | ND | ND | Y | N-CARBIDE |
| 77 | | P | 1 | Whately | ND | ND | 0.08 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 78 | | O | 1 | Whately | 0.04 | 0.28 | 3.30 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 79 | 0014 | P | 1 | Whately | 0.08 | ND | 0.08 | -- | -- | ND | -- | -- | -- | -- | -- | Y | N-CARBIDE |
| 80 | 0030 | P | 1 | Whately | ND | ND | 0.04 | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 81 | 0015 | P | 1 | Whately | ND | ND | 0.08 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 82 | 0014 | P | 1 | Whately | ND | ND | 0.41 | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 83 | 0020 | N | 1 | Whately | ND | ND | ND | -- | ND | 4.00 | -- | ND | ND | ND | ND | | 2 wells |
| 84 | 0012 | P | 1 | Whately | ND | ND | ND | -- | 1.00 | ND | -- | ND | ND | ND | ND | | |
| 85 | | N | 1 | Whately | -- | -- | -- | -- | ND | 3.00 | -- | ND | ND | ND | ND | | |
| 86 | 0020 | O | 1 | Whately | -- | -- | -- | -- | 16.0 | 35.0 | 7.00 | 1.00 | ND | ND | 1.66 | Y | M-CARBIDE, Two Samples |
| 87 | 0024 | P | 1 | Whately | 0.03 | ND | ND | -- | 1.20 | ND | -- | 2.20 | ND | ND | ND | | Two Samples |
| 88 | 0014 | P | 1 | Whately | ND | ND | 0.79 | -- | -- | 5.00 | -- | -- | -- | -- | -- | | |
| 89 | 0028 | P | 1 | Whately | ND | 0.23 | 0.10 | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 90 | 0040 | P | 1 | Whately | ND | ND | 0.12 | -- | -- | ND | -- | -- | -- | -- | -- | | |

TABLE 4-2
LIST OF POSITIVE RESULTS
FOR AGRICULTURAL CHEMICAL OVERLAYS

| MAP# | WELL DEPTH (ft) | STATUS | LAB | COMMUNITY | EDB-85 (ppb) | EDB-84 (ppb) | 1-2-D (ppb) | ALD-86 (ppb) | ALD-85 (ppb) | ALD-84 (ppb) | ALD-83 (ppb) | CARBOFURAN (ppb) | OXAMYL (ppb) | ALACHLOR (ppb) | DINOSEB (ppb) | F | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 91 | 0023 | P | 1 | Whately | ND | 0.13 | 0.69 | 27.0(3) | ND | 19.0 | -- | ND | ND | ND | ND | Y | M-CARBIDE |
| 92 | 0012 | O | 1 | Whately | ND | ND | 14.0 | -- | 8.20 | ND | -- | 6.60 | ND | ND | ND | | |
| 93 | 0028 | O | 1 | Whately | ND | 0.04 | 1.80 | -- | 8.80 | 36.0 | 19.0 | 3.60 | ND | ND | ND | Y | N-CARBIDE |
| 94 | 0020 | O | 1 | Whately | 0.03 | 0.06 | 35.0 | -- | 12.9 | 5.00 | ND | 3.80 | ND | ND | ND | | |
| 95 | 0028 | O | 1 | Whately | ND | 0.06 | 0.08 | 4.00(3) | 17.9 | 75.0 | 181. | 4.70 | ND | ND | ND | Y | N-CARBIDE |
| 96 | 0025 | O | 1 | Whately | 1.20 | 1.60 | 5.30 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 97 | 0036 | O | 1 | Whately | 0.55 | 3.20 | 5.00 | 24.0(3) | 24.5 | 29.0 | -- | 1.30 | ND | ND | ND | Y | M-CARBIDE |
| 98 | 0018 | O | 1 | Whately | 1.10 | 1.50 | 12.0 | -- | ND | 2.00 | ND | ND | ND | ND | ND | Y | |
| 99 | 0028 | O | 1 | Whately | 0.15 | 0.38 | 4.70 | 37.0(3) | 44.2 | 32.0 | -- | 1.50 | ND | ND | ND | Y | M-CARBIDE |
| 100 | | P | 1 | Whately | ND | ND | ND | -- | 2.00 | 3.00 | -- | ND | ND | ND | 2.10 | | Two Samples |
| 101 | 0022 | P | 1 | Whately | ND | ND | 0.13 | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 102 | 0034 | P | 1 | Whately | ND | ND | 0.31 | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 103 | 0011 | N | 1 | Whately | -- | -- | -- | -- | ND | 1.00 | -- | ND | ND | ND | ND | | |
| 104 | | N | 1 | Whately | ND | 0.21 | ND | -- | ND | ND | -- | ND | ND | ND | ND | Y | |
| 105 | 0009 | N | 1 | Whately | ND | 0.18 | ND | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 106 | 0013 | P | 1 | Whately | ND | ND | ND | -- | 1.20 | ND | -- | ND | ND | ND | ND | | |
| 107 | 0017 | O | 1 | Whately | ND | ND | 1.10 | -- | -- | ND | -- | -- | -- | -- | -- | | |
| 108 | 0017 | O | 1 | Whately | -- | -- | -- | -- | 10.8 | 8.00 | -- | ND | ND | ND | ND | | |
| 109 | 0016 | P | 1 | Whately | -- | -- | -- | -- | 3.00 | ND | -- | ND | ND | ND | ND | | |
| 110 | | P | 1 | Whately | ND | ND | ND | -- | 5.30 | 4.00 | -- | ND | ND | ND | ND | | |
| 111 | | P | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | ND | ND | 2.10 | | |
| 112 | | P | 1 | Whately | ND | ND | ND | -- | ND | ND | -- | ND | ND | ND | 1.49 | | |
| 113 | 0020 | N | 1 | Whately | -- | -- | -- | -- | ND | 2.00 | -- | ND | ND | ND | ND | | |
| 114 | | P | 1 | Whately | -- | -- | -- | -- | 3.90 | 6.00 | -- | ND | ND | 0.20 | 1.50 | | |
| 115 | | O | 1 | Whately | -- | -- | -- | -- | -- | 18.0 | -- | -- | -- | ND | ND | Y | N-CARBIDE |
| 116 | | O | 1 | Whately | ND | ND | ND | -- | 9.00 | 11.0 | -- | 36.6 | ND | ND | ND | Y | N-CARBIDE |
| 117 | 0026 | O | 1 | Whately | -- | -- | -- | -- | 4.30 | 15.0 | -- | ND | ND | ND | 9.20 | | R-CARBIDE |
| 118 | | P | 1 | Whately | -- | -- | -- | -- | 3.80 | 5.00 | -- | ND | ND | ND | ND | | |
| 119 | | P | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | ND | 1.00 | ND | ND | | |
| 120 | | P | 1 | Whately | -- | -- | -- | -- | ND | ND | -- | 1.40 | ND | ND | ND | | |
| 121 | 0006 | N | 1 | Whately | ND | 1.50 | ND | -- | ND | ND | -- | ND | ND | ND | ND | | Well #1, Cellar |
| 122 | 0020 | O | 1 | Whately | ND | ND | 1.20 | -- | 3.80 | 5.00 | -- | ND | ND | ND | ND | | |
| 123 | 0015 | O | 1 | Whately | 1.50 | 1.30 | 2.80 | -- | ND | 5.00 | -- | ND | ND | ND | ND | | |
| 124 | 0700 | O | 1 | Whately | 0.10 | 4.90 | 0.26 | -- | 45.6 | 4.90 | -- | ND | ND | ND | ND | Y | Well #1 |
| 125 | 0700 | R | 1 | Whately | 0.07 | ND | 0.24 | -- | -- | -- | -- | -- | -- | -- | -- | | Well #2 |
| 126 | | P | 1 | Whately | -- | -- | -- | -- | 2.70 | 3.00 | -- | ND | ND | ND | 0.59 | | Two Samples |
| 127 | | P | 1 | Whately | -- | -- | -- | -- | 2.96 | 5.00 | -- | ND | ND | ND | ND | | |
| 128 | | P | 1 | Whately | ND | ND | ND | -- | 4.60 | 3.00 | -- | 2.24 | ND | ND | ND | | |
| 129 | 0040 | P | 1 | Whately | ND | ND | 0.09 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 130 | | O | 1 | Whately | 1.40 | ND | 51.0 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 131 | | O | 1 | Whately | 0.12 | 0.13 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 132 | 0015 | P | 1 | Whately | 0.05 | 0.02 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | Well #2 |
| 133 | | O | 1 | Whately | 0.12 | 0.08 | ND | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 134 | 0020 | P | 1 | Whately | ND | ND | 0.06 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 135 | 0012 | P | 1 | Whately | ND | ND | 0.10 | -- | -- | -- | -- | -- | -- | -- | -- | | |

TABLE 4-2
LIST OF POSITIVE RESULTS
FOR AGRICULTURAL CHEMICAL OVERLAYS

| MAP# | WELL DEPTH (ft) | STATUS | LAB | COMMUNITY | EDB-85 (ppb) | EDB-84 (ppb) | 1-2-D (ppb) | ALD-86 (ppb) | ALD-85 (ppb) | ALD-84 (ppb) | ALD-83 (ppb) | CARBOFURAN (ppb) | OXAMYL (ppb) | ALACHLOR (ppb) | DINOSEB (ppb) | F | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 136 | 0014 | D | 1 | Whately | 0.05 | ND | 2.70 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 137 | | D | 1 | Whately | 0.10 | 0.06 | 20.0 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 138 | 0025 | P | 1 | Whately | ND | ND | 0.34 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 139 | 0020 | D | 1 | Whately | 0.10 | 2.60 | 26.0 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 140 | 0020 | P | 1 | Whately | ND | ND | 0.06 | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 141 | 0020 | P | 1 | Whately | ND | ND | 0.05 | -- | 4.20 | 4.00 | -- | 3.00 | ND | ND | ND | | |
| 142 | | P | 1 | Whately | ND | ND | 0.11 | -- | 2.20 | 3.00 | -- | 6.30 | ND | 0.42 | ND | | |
| 143 | 0022 | P | 1 | Whately | ND | ND | 0.10 | -- | ND | ND | -- | ND | ND | ND | ND | | |
| 144 | | P | 1 | Whately | ND | ND | 0.22 | -- | -- | -- | -- | -- | -- | -- | -- | | |
| 145 | | D | 1 | Whately | 0.26 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | Y | 5\86 |
| 146 | 0140 | D | 1 | Whately | 0.10 | 0.24 | 2.30 | -- | -- | -- | -- | -- | -- | -- | -- | Y | |

AND PESTICIDE

I AND USE ACTIVITY

CHEMICALS

TABLE 4-3
PUBLIC WATER SUPPLY SOURCES SHOWN ON OVERLAYS

| DEQE MAP NUMBER | COMMUNITY | WATER OWNER | WATER SOURCE | WATER SUPPLY NAME | COMMENTS |
|---|---|---|---|---|---|
| 11A-008-302A | Amherst | Amherst Water Division | Ground | Brickyard Well | Not in use, contaminated by landfill. 25 well points. |
| 11A-008-301A | Amherst | Amherst Water Division | Ground | Well #1 | Well Depth is 80 ft. |
| 11A-008-300A | Amherst | Amherst Water Division | Ground | Well #2 | Well depth is 60 ft. |
| 11A-008-303A | Amherst | Amherst Water Division | Ground | Well #4 | Well depth is 30 ft. |
| 11A-008-304A | Amherst | Amherst Water Division | Ground | Well #5 | Well depth is 120 ft. |
| 11A-008-005A * | Amherst | Military Reservation | Ground | | Non community public water supply. |
| 11A-024-302A | Belchertown | Amherst Water Division | Ground | Well #3 | Well depth is 100 ft. |
| 11A-024-303A | Belchertown | Belchertown State School | Ground | | Three wells, 25-35 ft. deep. |
| 11A-024-300A | Belchertown | Belchertown Water Dist. | Ground | | 19 well points. Well depth range is 15-24 ft. |
| 11A-024-301 | Belchertown | Belchertown Water Dist. | Ground | Diegle Well | Proposed well |
| 11A-024-306A | Belchertown | Bondsville F&W Dist. | Ground | Well #1 | Services several residences in Belchertown. |
| 11A-024-304A | Belchertown | Bondsville F&W Dist. | Ground | Well #2 | Services several residences in Belchertown. |
| 11A-024-305A | Belchertown | Bondsville F&W Dist. | Ground | Well #3 | Services several residences in Belchertown. |
| 11A-024-300B | Belchertown | Ludlow Water Dept. | Surface | Broad Brook | |
| 11A-024-007A * | Belchertown | Pine Valley Mobile Home | Ground | | Non community public water supply. |
| 11A-024-008A * | Belchertown | Sports Haven Trailor | Ground | | Non community public water supply. |
| 11A-029-201A | Bernadston | Bernadston F&W Dist. | Ground | | Well depth is 28 ft. |
| 11A-029-202A | Bernadston | Bernadston F&W Dist. | Ground | | Well depth is 78 ft. |
| 11A-029-203 | Bernadston | Mt. Herman School | Ground | | Proposed well awaiting DEQE approval. |
| 11A-029-300A | Bernadston | Mt. Herman School | Ground | Dry Brook Well | Non community public water supply. |
| 11A-029-004A * | Bernadston | Purple Meadows Campground | Ground | | Non community public water supply. |
| 11A-061-001A * | Chicopee | Mason Manor Apartments | Ground | | Non community public water supply. |
| 11A-068-300B | Conway | S. Deerfield Water Dist. | Surface | New Reservoir | 144,000,000 gal. capacity. Feeds Service Reservoir. |
| 11A-074-005A * | Deerfield | Deerfield Acadamy | Ground | | Non community public water supply. |
| 11A-074-301A | Deerfield | Deerfield F&W Dist. | Ground | Collecting Basin | Receives water from Harris and Stillwater Springs. 54 ft. dp |
| 11A-074-300A | Deerfield | Deerfield F&W Dist. | Ground | Collecting Well | Receives water from Wells and Keats Springs. |
| 11A-074-000M | Deerfield | Deerfield F&W Dist. | Ground | Keats Spring | Feeds into Collecting Well. |
| 11A-074-000M | Deerfield | Deerfield F&W Dist. | Ground | Stillwater Springs | |
| 11A-074-303A | Deerfield | Deerfield F&W Dist. | Ground | Stillwater Well | Well depth is 54 ft. |
| 11A-074-201A | Deerfield | Deerfield F&W Dist. | Ground | Wapping Village Well | Well is on standby. Well depth is 36 ft. |
| 11A-074-000M | Deerfield | Deerfield F&W Dist. | Ground | Harris Springs | |
| 11A-074-000M | Deerfield | Deerfield F&W Dist. | Ground | Wells Spring | Feeds into Collecting Well. |
| 11A-074-006A * | Deerfield | Eagle Brook School | Ground | | Non community public water supply. |
| 11A-074-303H | Deerfield | S. Deerfield Water Dist. | Ground | Sugarloaf Rd. | Shut down in 1984, EDB contamination. Well depth is 44 ft. |
| 11A-087-303A | Easthampton | Easthampton Water Dept. | Ground | | Well has been shutdown. |
| 11A-087-301A | Easthampton | Easthampton Water Dept. | Ground | Hendrick Street Well | 100 small wells supplying to Pines Well. |
| 11A-087-300A | Easthampton | Easthampton Water Dept. | Ground | Malony/Lovefield Well | Well depth is 140 ft. |
| 11A-087-006 * | Easthampton | Easthampton Water Dept. | Ground | Nonotuck Park | Proposed Well |
| 11A-087-201A | Easthampton | Easthampton Water Dept. | Ground | Nonotuck Park Well | Well depth is >100 ft. |
| 11A-087-202A | Easthampton | Easthampton Water Dept. | Ground | Pines Well | Well depth is >100 ft. |
| 11A-091-203A | Erving | Erving Paper Co. | Ground | | Outside the scope of this study |
| 11A-091-302A | Erving | Millers Falls F&W dist. | Ground | | Well depth is 54 ft. |
| 11A-106-000M | Gill | Riverside Water dept. | Ground | | Old spring, no longer in use. |
| 11A-111-300A | Granby | Bachelor Knolls Inc. | Ground | | Non community public water supply |
| 11A-111-003A * | Granby | Elderly Housing | Ground | | Non community public water supply. |
| 11A-111-001A * | Granby | Granby Heights Condo's | Ground | | Non community public water supply. |
| 11A-111-002A * | Granby | Mt. Hyacinth College | Ground | | Non community public water supply. |

TABLE 4-3

PUBLIC WATER SUPPLY SOURCES SHOWN ON OVERLAYS

| DEQE MAP NUMBER | COMMUNITY | WATER OWNER | WATER SOURCE | WATER SUPPLY NAME | COMMENTS |
|---|---|---|---|---|---|
| 11A-111-004A * | Granby | Mt.Hyacinth College | Ground | | Non community public water supply. |
| 11A-112-300F | Granville | Granville Ctr. Water Dept | Surface | Winchell Reservoir | Outside the scope of this study. |
| 11A-112-301B | Granville | Westfield Water Dept. | Surface | Granville Reservoir | |
| 11A-114-201A | Greenfield | Greenfield Water Dept. | Ground | Mill Brook Well #1 | Well depth is 124.5 ft. |
| 11A-114-202A | Greenfield | Greenfield Water Dept. | Ground | Mill Brook Well #2 | Well depth is 83.6 ft |
| 11A-114-306 | Greenfield | Greenfield Water Dept. | Ground | Leary Site Well | Future well not yet developed. |
| 11A-114-302P | Greenfield | Greenfield Water Dept. | Ground | | Well is not connected to the distribution system. |
| 11A-114-203A | Greenfield | Greenfield Water Dept. | Ground | Mill Brook Well #3 | Well depth is 82.5 ft. |
| 11A-114-204A | Greenfield | Greenfield Water Dept. | Surface | | Supplementary water supply pumped from the Green River. |
| 11A-117-304A | Hadley | Hadley Water Dept. | Ground | Bay Road Well #4 | Well depth is about 75 ft. |
| 11A-117-301A | Hadley | Hadley Water Dept. | Ground | Mt. Warner Well #1 | Well depth is about 75 ft. |
| 11A-117-300A | Hadley | Hadley Water Dept. | Ground | Mt. Warner Well #2 | Well depth is about 75 ft. |
| 11A-117-305A | Hadley | Hadley Water Dept. | Ground | Bay Road Well #3 | Well depth is about 75 ft. |
| 11A-117-301F | Hadley | Hadley Water Dept. | Surface | Hadley Reservoir | Presently not connected to the distribution system. |
| 11A-117-306F | Hadley | Hadley Water Dept. | Surface | Parker Reservoir | Presently not connected to the distribution system. |
| 11A-117-300F | Hadley | Hadley Water Dept. | Surface | Upper Hadley Reservoir | Presently not connected to the distribution system. |
| 11A-117-008A * | Hadley | Mitch's Marina | Ground | | Non community public water supply. |
| 11A-127-201A | Hatfield | Hatfield Water Dept. | Ground | West Hatfield Well | Well depth is 125 ft. |
| 11A-127-302A | Hatfield | Hatfield Water Dept. | Ground | Omasta Well | Well depth is 170 ft. |
| 11A-127-300B | Hatfield | Hatfield Water Dept. | Surface | Running Gutter Reservoir | |
| 11A-137-302A | Holyoke | Holyoke Water Dept. | Ground | Coronet Wells | Emergency hookup from Westfield is available. |
| 11A-137-307A | Holyoke | Holyoke Water Dept. | Ground | Pequot Well | Outside the scope of this study. |
| 11A-137-308A | Holyoke | Holyoke Water Dept. | Ground | Pequot Well | Outside the scope of this study. |
| 11A-137-303B | Holyoke | Holyoke Water Dept. | Surface | McLean Reservoir | Outside the scope of this study. |
| 11A-137-300B | Holyoke | Holyoke Water Dept. | Surface | Mt. Park Reservoir | Outside the scope of this study. |
| 11A-137-306B | Holyoke | Holyoke Water Dept. | Surface | Whiting Street Reservoir | Outside the scope of this study. |
| 11A-137-305B | Holyoke | Holyoke Water Dept. | Surface | Ashley Pond | Outside the scope of this study. |
| 11A-137-304B | Holyoke | Holyoke Water Dept. | Surface | Wright Pond | Outside the scope of this study. |
| 11A-156-300B | Leyden | Greenfield Water Dept. | Surface | Greenfield Reservoir | 45,000,000 gal. capacity |
| 11A-159-202C | Longmeadow | Longmeadow Water Dept. | Ground | Well #2 | Outside the scope of this study. |
| 11A-159-201C | Longmeadow | Longmeadow Water Dept. | Ground | Well #1 | Outside the scope of this study. |
| 11A-161-300B | Ludlow | Springfield Water Dept. | Surface | Springfield Reservoir | Outside the scope of this study. |
| 11A-191-302E | Monson | Monson State Hospital | Ground | Well Field | Outside the scope of this study. |
| 11A-191-308A | Monson | Monson Water Dept. | Ground | | Outside the scope of this study. |
| 11A-191-309A | Monson | Monson Water Dept. | Ground | | Outside the scope of this study. |
| 11A-191-305A | Monson | Monson Water Dept. | Ground | | Outside the scope of this study. |
| 11A-192-305B | Montaque | Lake Pleasant Water Dist. | Surface | Green Pond | |
| 11A-192-301B | Montaque | Lake Pleasant Water Dist. | Surface | Lake Pleasant | |
| 11A-192-000M | Montaque | Montaque Ctr Water Dist. | Ground | | Well depth is 12 ft. |
| 11A-192-303A | Montaque | Turners Falls Fire Dist. | Ground | | Well depth is 160 ft. |
| 11A-192-302A | Montaque | Turners Falls Fire Dist. | Ground | Central Street Well | Well depth is 110 ft. |
| 11A-194-301D | Montgomery | Westfield Water Dept. | Surface | Tekoa Reservoir | Reservoir is currently in reserve. |
| 11A-194-300D | Montgomery | Westfield Water Dept. | Surface | Westfield Reservoir | Reservoir is currently in reserve. Drians to Tekoa Reservoir |
| 11A-204-300B | New Salem | MWRA | Surface | Quabbin Reservoir | |
| 11A-214-203A | Northampton | Northampton Water Dist. | Ground | Spring Street Well | Well depth is 88 ft. |
| 11A-214-200A | Northampton | Northampton Water Dist. | Ground | Clark Street Well | Well depth is 85 ft. |
| 11A-214-301B | Northampton | Northampton Water Dist. | Surface | Upper Reservoir | Feeds Roberts Reservoir by open stream. |

TABLE 4-3
PUBLIC WATER SUPPLY SOURCES SHOWN ON OVERLAYS

| DEQE MAP NUMBER | COMMUNITY | WATER OWNER | WATER SOURCE | WATER SUPPLY NAME | COMMENTS |
|---|---|---|---|---|---|
| 11A-214-302B | Northampton | Northampton Water Dist. | Surface | Roberts Meadow Reservoir | Fed by Upper Reservoir. |
| 11A-217-300B | Northfield | Mt. Herman/Northfield Sch | Surface | Grandville Reservoir | 28,000,000 gal. capacity. |
| 11A-217-301C | Northfield | Northfield Water Dist. | Ground | | Well is presently in a standby mode. |
| 11A-217-000G | Northfield | Northfield Water Dist. | Ground | Sturbridge Road | Well depth is 18 ft. |
| 11A-217-302B | Northfield | Northfield Water Dist. | Surface | Northfield Reservoir | |
| 11A-227-306A | Palmer | Palmer Fire Dist. #1 | Ground | Gravel Pack Well #2 | Outside the scope of this study. |
| 11A-227-307A | Palmer | Palmer Fire Dist. #1 | Ground | Glaxey Well Field | Outside the scope of this study. |
| 11A-227-300B | Palmer | Palmer Fire Dist. #1 | Surface | Hamilton Reservoir | Outside the scope of this study. |
| 11A-227-301B | Palmer | Palmer Fire Dist. #1 | Surface | Palmer Reservoir | Outside the scope of this study. |
| 11A-227-304A | Palmer | Three Rivers Fire Dist. | Ground | | Services several residences in Belchertown. |
| 11A-227-305E | Palmer | Three Rivers Fire Dist. | Ground | | Services several residences in Belchertown. |
| 11A-227-003 * | Palmer | Three Rivers Fire Dist. | Ground | | Proposed Well. |
| 11A-230-301B | Pelham | Amherst Water Division | Surface | Intake Reservoir | Receives water from Hill and Hawley Resevoirs via streams. |
| 11A-230-302B | Pelham | Amherst Water Division | Surface | Hill Reservoir | |
| 11A-230-300B | Pelham | Amherst Water Division | Surface | Hawley Reservoir | |
| 11A-256-200A | Russell | Russell Water Dept. | Ground | Gravel Pack Well #1 | Outside the scope of this study. |
| 11A-256-301D | Russell | Russell Water Dept. | Surface | Russell Reservoir | Outside the scope of this study. |
| 11A-272-300B | Shutesbury | Amherst Water Division | Surface | Atkins Reservoir | |
| 11A-275-303F | South Hadley | S. Hadley Fire Dist. #1 | Surface | Leaping Well Reservoir | Presently not being used. Receives water from MWRA. |
| 11A-275-302A | South Hadley | S. Hadley Fire Dist. #2 | Ground | Thermophylae Well | Well depth is 98 ft. Future wells in same area. |
| 11A-275-301E | South Hadley | S. Hadley Fire Dist. #2 | Ground | Well #1 | Well depth is 20 ft. |
| 11A-275-304E | South Hadley | S. Hadley Fire Dist. #2 | Ground | Well #2 | Well depth is 20 ft. |
| 11A-275-300B | South Hadley | S. Hadley Fire Dist. #2 | Surface | Lithia Springs Reservoir | Used only to recharge Wells #1and2. |
| 11A-276-303B | Southampton | Holyoke Water Department | Surface | Tighe Carmody Reservoir | Reservoir is operated by Holyoke, Southampton guaranteed wtr |
| 11A-276-300A | Southampton | Southampton Water Dept. | Ground | College Highway Well | Well depth is 160-200 ft. |
| 11A-276-301C | Southampton | Southampton Water Dept. | Ground | | Future Well not yet developed. |
| 11A-276-304B | Southampton | Southampton Water Dept. | Surface | New Intake Reservoir | Reservoir drained and abandoned. |
| 11A-279-301A | Southwick | Southwick Water Dept. | Ground | Well #1 | Well depth is 112 ft. |
| 11A-279-302H | Southwick | W. Springfield Water Dept | Ground | Well #2 | Closed-EDB. Outside the scope of this study. |
| 11A-279-303H | Southwick | W. Springfield Water Dept | Ground | Well #3 | Closed-EDB. Outside the scope of this study. |
| 11A-279-304H | Southwick | W. Springfield Water Dept | Ground | Well #4 | Closed-EDB. Outside the scope of this study. |
| 11A-279-305H | Southwick | W. Springfield Water Dept | Ground | Well #1 | Closed-EDB. Outside the scope of this study. |
| 11A-289-003A * | Sunderland | Cliff Side Appartments | Ground | | Non community public water supply. |
| 11A-289-004A * | Sunderland | Pond Ridge Condo's | Ground | | Non community public water supply. |
| 11A-289-300C | Sunderland | Sunderland Water Dist. | Ground | | Well is currently in standby. |
| 11A-289-301A | Sunderland | Sunderland Water Dist. | Ground | | Well depth is 80 ft. |
| 11A-289-302A | Sunderland | Sunderland Water Dist. | Ground | | Well depth is 97 ft. |
| 11A-325-300B | W. Springfield | W. Springfield Water Dept | Surface | Bear Hole Reservoir | Outside the scope of this study. |
| 11A-329-308F | Westfield | Springfield Water Dept. | Surface | Cobble Mountain Reservoir | Filtration Plant for Springfield Aquaduct. |
| 11A-329-209E | Westfield | Western Ma. Hospital | Ground | | Non community public water supply. |
| 11A-329-303A | Westfield | Westfield Water Dept. | Ground | Well #2 | Well depth is 122 ft. |
| 11A-329-302A | Westfield | Westfield Water Dept. | Ground | Well #1 | Well depth is 117.5 ft. |
| 11A-329-307A | Westfield | Westfield Water Dept. | Ground | Well #6 | Well depth is 77 ft. |
| 11A-329-301A | Westfield | Westfield Water Dept. | Ground | Well #7 | Well depth is 171 ft. |
| 11A-329-300A | Westfield | Westfield Water Dept. | Ground | Well #8 | Well depth is 184 ft. |
| 11A-329-309 | Westfield | Westfield Water Dept. | Ground | Well #9 | Proposed well site. |
| 11A-329-306A | Westfield | Westfield Water Dept. | Ground | Well #5 | Well depth is 71 ft. |

TABLE 4-3

PUBLIC WATER SUPPLY SOURCES SHOWN ON OVERLAYS

| DEQE MAP NUMBER | COMMUNITY | WATER OWNER | WATER SOURCE | WATER SUPPLY NAME | COMMENTS |
|---|---|---|---|---|---|
| 11A-329-304A | Westfield | Westfield Water Dept. | Ground | Well #3 | Well depth is 124 ft. |
| 11A-329-305A | Westfield | Westfield Water Dept. | Ground | Well #4 | Well depth is 121 ft. |
| 11A-331-301B | Westhampton | Holyoke Water Works | Surface | White Reservoir | Outside the scope of this study. |
| 11A-331-300B | Westhampton | Westhampton Water Co. | Surface | Mountain Brook Reservoir | Outside the scope of this study. |
| 11A-337-301B | Whately | Northampton Water Dist. | Surface | Frances P. Ryan Reservoir | |
| 11A-337-300B | Whately | Northampton Water Dist. | Surface | Northampton Reservoir | |
| 11A-337-304B | Whately | S. Deerfield Water Dist. | Surface | Service Reservoir-Old Dam | 10,000,000 gal. capacity. Fed by New Reservoir. |
| 11A-337-305A * | Whately | Whately Water Department | Ground | | |
| 11A-337-306 * | Whately | Whately Water Department | Ground | | Proposed well. |
| 11A-337-303A | Whately | Whately Water Dist. | Ground | | Well depth is 400 ft. |
| 11A-337-302A | Whately | Whately Water Dist. | Ground | | Well depth is 350 ft. |
| 11A-339-300E | Wilbraham | | Ground | | Outside the scope of this study. Town receives MWRA water. |
| 11A-340-302B | Williamsburg | Northampton Water Dist. | Surface | Mountain Street Reservoir | |
| 11A-340-303A | Williamsburg | Williamsburg Water Dept. | Ground | | Outside the scope of this study. |
| 11A-340-304B | Williamsburg | Williamsburg Water Dept. | Surface | Upper Unquomonk Reservoir | Outside the scope of this study. |
| 11A-340-300B | Williamsburg | Williamsburg Water Dept. | Surface | Unquomonk Reservoir | Outside the scope of this study. |

Note: * indicates that the DEQE map number was developed for this study following DEQE format.

TABLE 4-4
RESULTS OF DEQE SAMPLING PROGRAM BY TOWN

| Town | Sample Sites | Sample Sites with Positive Results | ETHYLENE DIBROMIDE | | 1,2-DICHLORO-PROPANE | | ALDICARB | | CARBOFURAN | | OXAMYL | | ALACHLOR | | DINOSEB | | Sites with More than One Positive Result |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sites Sampled | Positive Results | Sites Sampled | Positive Results | Sites Sampled | Positive Results | Sites Sampled | Positive Results | Sites Sampled | Positive Results | Sites Sampled | Positive Results | Sites Sampled | Positive Results | |
| Agawam | 16 | 0 | 9 | 0 | 9 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Amherst | 7 | 1 | 2 | 0 | 2 | 1 | 7 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 0 |
| Belchertown | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bernardston | 2 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Deerfield | 10 | 4 | 5 | 2 | 4 | 2 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Easthampton | 4 | 2 | 4 | 0 | 4 | 2 | 4 | 0 | 4 | 0 | 4 | 0 | 4 | 0 | 4 | 0 | 0 |
| Gill | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Granby | 31 | 3 | 0 | 0 | 0 | 0 | 31 | 3 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 0 |
| Greenfield | 4 | 0 | 4 | 0 | 4 | 0 | 4 | 0 | 4 | 0 | 4 | 0 | 4 | 0 | 4 | 0 | 0 |
| Hadley | 7 | 0 | 5 | 0 | 5 | 0 | 4 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 0 |
| Hatfield | 13 | 5 | 12 | 1 | 12 | 5 | 4 | 0 | 3 | 0 | 3 | 0 | 3 | 0 | 3 | 0 | 1 |
| Montague | 9 | 3 | 6 | 0 | 6 | 2 | 7 | 1 | 4 | 0 | 4 | 0 | 4 | 0 | 4 | 0 | 0 |
| Northampton | 5 | 1 | 0 | 0 | 0 | 0 | 5 | 1 | 3 | 0 | 3 | 0 | 3 | 0 | 3 | 0 | 0 |
| Northfield | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| South Hadley | 4 | 0 | 2 | 0 | 2 | 0 | 4 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 0 |
| Southampton | 3 | 2 | 3 | 0 | 3 | 2 | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 0 |
| Southwick | 27 | 18 | 26 | 9 | 26 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| Sunderland | 29 | 7 | 22 | 4 | 16 | 3 | 12 | 2 | 6 | 1 | 6 | 0 | 6 | 0 | 6 | 0 | 3 |
| Westfield | 9 | 2 | 9 | 0 | 8 | 2 | 6 | 0 | 6 | 0 | 6 | 0 | 6 | 0 | 6 | 0 | 0 |
| Whately | 176 | 98 | 132 | 43 | 129 | 54 | 112 | 42 | 80 | 14 | 80 | 1 | 81 | 2 | 81 | 9 | 42 |
| TOTALS | 358 | 146 | 243 | 57 | 232 | 87 | 218 | 50 | 130 | 15 | 130 | 1 | 131 | 2 | 131 | 9 | 52 |

# 5. RECOMMENDATIONS FOR TOWNS IN THE STUDY AREA

This section presents recommendations for the 20 towns in the study area. The section discusses each town individually with specific recommendations based on the findings of this study. It also provides general recommendations for using the information in this report as well as programs which can be implemented by each town for helping each town understand their specific needs and potential risk.

The results of this study indicate that agricultural chemical contamination of ground and surface water supplies is not an isolated event, but could occur anywhere that shallow aquifer groundwater is used for potable water. As noted previously in this report, if a well is shown as contaminated and adjacent ones are not, it may just mean that the adjacent wells were not sampled. It is important to note that <u>"no result"</u> <u>does</u> <u>not</u> <u>imply</u> <u>"free of pesticides"</u>. In addition, this study did not deal with the issue of contamination of private wells, which are equally at risk as public supplies. Consequently, it is recommended that each town undertake the following activities:

A. Develop a Well Inventory of <u>all</u> wells used for potable water in the town and map each well on an overlay to the USGS base provided in this study. Information for each well should be tabulated for the inventory and should include:

- name of owner
- location of well (street address and map number)
- depth of well
- installation date
- installer
- use of the water
- record of any testing by date of test and finding

B. Establish a monitoring program for private wells. It is recommended that the program be started using the information provided in this report and on the agricultural land use overlays to determine those areas most likely to be at risk due to proximity to agricultural activities and distance from public water distribution systems. Organize a sampling program to test in high risk areas first, then expand to areas of lesser risk. Sampling should be repeated at least annually in high risk areas or areas where contamination has been found.

C. Conduct surveys of areas with known or potential problems to determine chemical usage. It is suggested that farmers be interviewed to determine what crops are routinely grown on fields near water supplies and what chemicals are routinely used. This information could then be

used to focus sampling on only those chemicals known to be used and present in the well recharge area.

D. All towns with public wells should attempt to determine the recharge areas for their wells. This will help to establish a correlation between water supplies and agricultural activities. The recharge areas could then be drawn on the overlays to determine the potential for contamination from the land use activities in the recharge area. If the recharge areas are not known, then the towns could use a half mile radius circle around the wells, in accordance with DEQE policy enacted August 27, 1987, as a first approximation though the recharge areas should eventually be determined.

E. Conduct serial surveys to map agricultural usage. Numerous problems were encountered in the aerial photo interpretation required for the agricultural land use overlays. To avoid similar problems in the future, it is recommended that a carefully organized program for future aerial photography be developed to include the following:

- False color infra-red photography be used to facilitate the interpretation of crop types and conditions.

- Photographs be taken during the first two weeks of August in order to capture the largest percentage of crops in the field and at their maximum stage of development.

- Photographs be taken at a scale of 1:12,000 (1 inch = 1,000 ft) in order to improve the ability to distinguish between crop types and to reduce the minimum unit of delineation.

- Ensure that personnel performing the photo interpretation are given the opportunity to do adequate ground truthing at the time the aerials are taken.

In addition to the above general recommendations for all towns in the study area, several towns had positive results for one or more of the seven agricultural chemicals in their public water supplies. Towns that have found contamination in their water supplies include:

- Amherst
- Deerfield
- Easthampton
- Hatfield
- Montague (Turners Falls Fire District)
- Southampton
- Southwick
- Westfield

Towns with contaminated water supplies should consider implementing a study to determine the source of contamination. This study could include:

- Determination of groundwater flows through the use of piezometers in the aquifer.

- Surveying past and present chemical usage by farmers on upgradient fields. (The list of chemicals could be large. See Table 2-3. The EPA has published sampling and analytical procedures for many of these chemicals. See 40CFR136. There are several screening procedures that can be employed to determine contamination. The screening procedure to be used depends on the pesticide in question. See 40CFR136 Table 1D for guidance.)

- Water quality analysis of groundwater from the upgradient peizometers.

- Analysis of soil samples from the piezometers to determine contamination versus depth.

- Computer modelling study of pesticide migration to estimate the extent of past contamination and predict future contamination.

Review of the agricultural land use overlays in conjunction with the water supply overlays resulted in recommending areas into which groundwater testing should be expanded. The following sections present discussions of land use activities and recommendations for monitoring and testing for each town in the study area.

In general, measurement of deep wells should be confirmed. If the test was positive and the depth is correct than either the well is not sealed properly or the deeper aquifer is contaminated.

Intertown connection potential and supply of public water from portions of one town to portions of another should be investigated, if not for current use, then for future use.

## 5.1 AGAWAM

### 5.1.1 Agricultural Land Use

One of the primary purposes of this study has been to map land use activities which are known to actively use agricultural chemicals. The most apparent trend to be noted from this effort is the overall loss in agricultural land. Between 1972 and 1985, the town of Agawam saw a reduction in the area of its land committed to agricultural production of over 2,292 acres or 49 percent.

The area committed to agriculture in Agawam in 1972 represented 31 percent of total town land area. The major portion (55 percent) of the agricultural land use types were identified as tilled. (Table 5-1 lists acreages for each of the land use classifications mapped in this study in Agawam). Considering that these photographs were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (Mixed Vegetables) without chlorophyll sensitive film. Of the remaining pesticide-related land use types, corn was the most common crop in Agawam in 1972 and was grown on about 16 percent of the total area committed to agriculture. Tobacco accounted for 8 percent of the total, with Golf Courses, Nurseries and Orchards having 7, 1 and <1 percent respectively.

By 1985, land use in the study area had shifted considerably. At that time only 16 percent of the overall land in Agawam remained committed to agriculture.

Between 1972 and 1985 production of Mixed Vegetables increased by 352 acres (141 percent), and land dedicated to Golf Courses and Orchards remained relatively constant at about 350 acres and 22 acres, respectively. Tobacco and Nurseries, on the other hand, dropped to 10 and 0 percent of their 1972 areas. Corn dropped 538 acres (73 percent) and Pasture, Tilled, and Harvested Grasses combined dropped 1733 acres (60 percent). (See the 1972 and 1985 Agricultural Land Use overlays for crop distribution within the town).

### 5.1.2 Water Supply & Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20 town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Agawam, 16 sites were sampled with no sites having a positive result.** Table 4-1 lists the sample locations with the sample results for all towns in the study area.

The public water supply overlays were developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of groundwater and surface waters for both community and noncommunity supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the public supplies. The overlays also show the distribution systems for the public water supplies.

Approximately 97 percent of the population in Agawam receives their potable water from the Agawam Water Supply which is supplied by the Springfield Regional System via interconnections with the Springfield Aqueduct. The remainder of Agawam's population receives their potable water from private wells.

As part of the DEQE sampling program 16 sites in Agawam (all private wells) have been sampled for Ethylene Dibromide, 1,2-Dichloropropane, or Aldicarb. The other four agricultural chemicals were not sampled for. The majority of sampling took place in the southwest corner of Agawam along Barry Street and Pine Street. Out of the 16 sample locations, nine were sampled for Ethylene Dibromide and 1,2-Dichloropropane and eight were sampled for Aldicarb. No positive results were found for any of these three chemicals.

Since the vast majority of residents in Agawam receive their potable water from the Springfield Regional System which is derived from surface water sources, the threat of consumption of agricultural chemical contaminated water here is small: surface water sources are less likely to become contaminated with agricultural chemicals. Consequently, monitoring for contamination by the Regional System should be able to detect contamination and implement corrective measures prior to distribution.

### 5.1.3 Recommendations For Agawam

Though no contamination has yet been found in the southwest corner of Agawam, the sampling program should be continued at least annually since the potential for contamination still exists. The 1972 and 1985 Agricultural Land Use overlays show that fields in this general area have been used to grow harvested grasses, mixed vegetables, corn, and tobacco. From Table 2-3, the list of chemicals recommended for these crops by the New England Agricultural Extension Service is extensive. Prior to sampling for these chemicals, surveys of chemical usage on nearby fields should be made to determine which chemicals to be sampled for.

TABLE 5-1

AGAWAM LAND USE

1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
| Corn | 739 | 16 | 201 | 8 | -538 | -73 |
| Pasture | 319 | 7 | 51 | 2 | -268 | -84 |
| Tilled | 2566 | 55 | 499 | 21 | -2067 | -81 |
| Harvested Grasses | -- | -- | 602 | 25 | -602 | -- |
| Tobacco | 375 | 8 | 36 | 2 | -339 | -90 |
| Orchard | 23 | <1 | 22 | 1 | -1 | -4 |
| Mixed Vegetables | 250 | 5 | 602 | 25 | 352 | 141 |
| Golf Course | 338 | 7 | 360 | 15 | 22 | 6 |
| Nursery | 55 | 1 | 0 | 0 | -55 | -100 |
| TOTAL | 4665 | 100 | 2373 | 100 | -2292 | -49 |

Area of Town 15,168

Note: Only the land use categories listed above were mapped. Forest, urban areas, etc. were not included.

WATER SUPPLY

AGAWAM


WATER SUPPLY LEGEND

| [illegible] | [illegible] |
|---|---|
| | [illegible] |
| | [illegible] |
| | [illegible] |
| | [illegible] |
| | [illegible] |
| | [illegible] |

LEGEND-WATER SUPPLY PIPELINES

| [illegible] | [illegible] | [illegible] | [illegible] |
|---|---|---|---|
| 4 | | [illegible] | |
| 6 | | [illegible] | |
| 8 | | 20 | |
| 10 | | 24 | |
| 12 | | 30 | |
| 14 | | | |

# Connecticut River Valley Pesticide Study

The Commonwealth Of Massachusetts

Department Of Environmental Quality Engineering

Division Of Water Supply

WATER SUPPLY LEGEND

LEGEND-WATER SUPPLY PIPELINES

# Connecticut River Valley Pesticide Study

LEGEND-AGRICULTURAL CHEMICALS

| AGRICULTURAL CHEMICALS | [illegible] | | AGRICULTURAL CHEMICALS | [illegible] | |
|---|---|---|---|---|---|
| | PRESENT | [illegible] | | PRESENT | [illegible] |
| ETHYLENE DIBROMIDE | □ | ■ | OXAMYL | X | X |
| ALDICARB | △ | ▲ | DINOSEB | ) | ) |
| ALACHLOR | ▽ | ▼ | | | |
| CARBOFURAN | ◇ | ◆ | | | |
| 1,2-DICHLOROPROPANE | + | + | | | |

# Connecticut River Valley Pesticide Study

PREPARED BY
[illegible]
[illegible]
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

**1986 AGRICULTURAL**
**LAND USE**

**AGAWAM**
**MASSACHUSETTS**

LAND USE
LEGEND

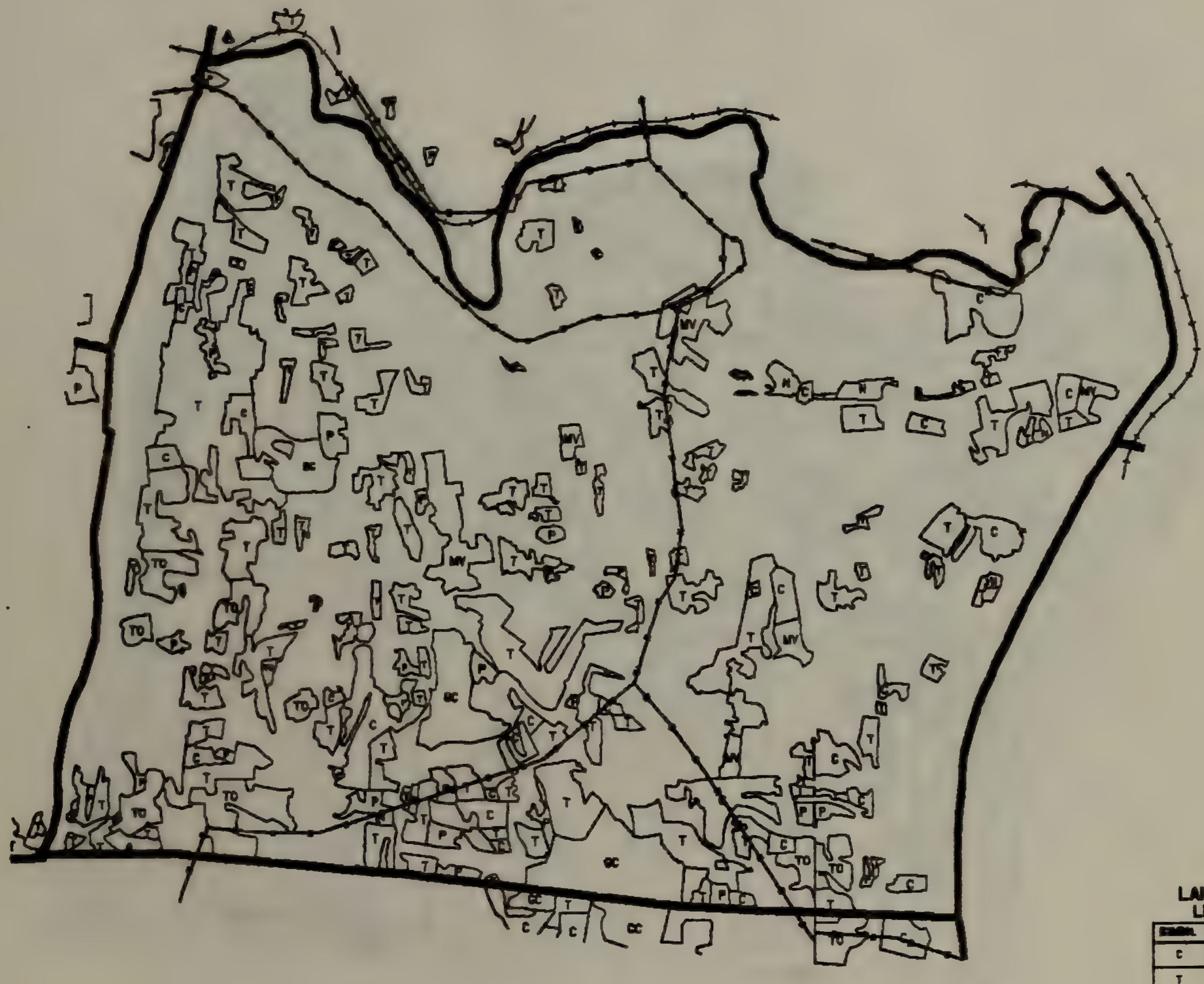
| SYMBOL | DESCRIPTION |
|---|---|
| C | CORN |
| T | TILLED |
| P | PASTURE |
| H | HARVESTED GRASSES |
| [illegible] | ORCHARD |
| [illegible] | NURSERY |
| GC | GOLF COURSE |
| TO | TOBACCO |
| MV | MIXED VEGETABLES |
| [illegible] | RAILROAD |
| [illegible] | TRANSMISSION LINE |

# Connecticut River Valley Pesticide Study

PREPARED BY
[illegible] ENGINEERING CORPORATION
BOSTON, MASSACHUSETTS
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

1972 AGRICULTURAL
LAND USE

AGAWAM
MASSACHUSETTS



LAND USE
LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| C | CORN |
| T | TILLED |
| P | PASTURE |
| H | HARVESTED GRASSES |
| O | ORCHARD |
| N | NURSERY |
| GC | GOLF COURSE |
| TO | TOBACCO |
| MV | MIXED VEGETABLES |
| —•— | RAILROAD |
| —— | TRANSMISSION LINE |

# Connecticut River Valley Pesticide Study

PREPARED BY
[illegible]
[illegible], MASSACHUSETTS
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987


AGAWAM
AGAWAM
CONNECTICUT
RIVER

## 5.2 AMHERST

### 5.2.1 Agricultural Land Use

Between 1972 and 1985 the town of Amherst saw a 3,686 acres or 55 percent reduction in the area of its land committed to agricultural production. The largest overall changes were in land use types which were reclassified using the improved 1985 photography, such as pasture, tilled and harvested grasses. Other than reclassified areas, corn had the largest change having lost 442 acres. Golf courses gained 56 acres, which may reflect the increasingly residential and commercial nature of the area.

The area committed to agriculture in Amherst in 1972 represented about 38 percent of total town land area. The major portion (50 percent) of these land uses types were identified as tilled. (Table 5-2 lists acreages for each of the land use classifications mapped in this study in Amherst.) Considering that the photographs used in this study were taken in July, this is an unusually high percentage of tilled land. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (Mixed Vegetables) without chlorophyll sensitive film.

Aside from the tilled land, corn was the most common crop and was grown on about 12 percent of the total area committed to agriculture. Orchards accounted for 5 percent of the total, with golf courses, nurseries and tobacco having a combined total of about 4 percent.

By 1985, land use in the study area had shifted considerably. At that time only 17 percent of the overall land in Amherst remained committed to agriculture. The total area of farmland was down to 3,062 acres: a drop of 3,686 acres or 55 percent from the 1972 total.

Within Amherst, the tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of till is still inflated, however, over the normal mid-summer conditions because of the late September photography. The land use classifications most likely to be affected by this situation includes corn, harvested grasses and mixed vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall and land use delineation is, however, far more accurate and precise than that made for 1972. Harvested grasses were the major agricultural type and represented about 53 percent of the land area mapped in Amherst. This area may, however, include winter wheat due to the end of season photography date. Pasture is the next most important agricultural land use with 22 percent of the agricultural land in Amherst dedicated to its production. Corn and golf courses represented an additional 12 and 8 percent of the mapped area respectively. Tilled land and orchards accounted for a minimal proportion of the land with 1 percent each, and tobacco and nurseries were not represented at all.

### 5.2.2 Water Supply & Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and The Department of Food and Agriculture. Within the 20 town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Amherst, seven sites were sampled with one site having a positive result.** Table 4-1 lists the sample locations with the sample results.

Positive results are shown on the Agricultural Chemical overlays as either a light character or a dark character depending on whether or not the concentration measured was over the Massachusetts Interim Drinking Water Guidelines (IDWG). The dark characters represent locations where the concentrations found were over the guidelines. The light characters represent locations where the concentrations were less than or equal to the IDWG **or where the concentrations were at one time over the IDWG but on subsequent sampling were found to be less than the IDWG or not detected at all.** Table 2-4 lists the IDWG for the seven agricultural chemicals. The locations with positive results are labeled with a map number and the well depth, if applicable or available. The map numbers for the locations with positive results are shown on Table 4-2.

The public water supply overlays were developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of groundwater and surface waters for both community and noncommunity supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the public supplies. The overlays also show the distribution systems for the public water supplies.

Approximately 99 percent of the population of Amherst receives their potable water from the Amherst Water Division. The Water Division obtains its water from five wells, one of which is located in Belchertown and four reservoirs; three of the four reservoirs are located in Pelham and one is located in Shutesbury. One additional well area was closed in 1984 by the DEQE because of contamination from a nearby landfill. The Water Division also has a future site for a well in the northwest section of Belchertown. In 1986, about 50 percent of the potable water supplied by the Water Division came from ground water. One well and one reservoir, located in Shutesbury, have been tested for one or more of the seven chemicals with the well showing a positive result for 1,2-Dichloropropane that was less than the IDWG limit.

Seven sites (five private) in Amherst have been sampled for one or more of the seven agricultural chemicals as part of the DEQE sampling program with only one sample site, the Water Division's well, having a positive result. Two of the seven sites were sampled for all seven chemicals while the other five were only sampled for Aldicarb. The majority of sampling was performed in the northwest portion of Amherst along Russelville Road.

Examination of the land use overlays in the area where agricultural chemical contamination occurred (in the Lawrence Swamp area in the southeast corner of Amherst) and the shallow depth of the contaminated well indicate that the 1,2-Dichloropropane contamination may be from the adjacent cultivated farm land. The land use overlays show that in 1985 this area was used to grow mixed vegetables and harvested grasses and in 1972 this land was used for an orchard and was tilled. Table 2-3 lists the chemicals that are recommended for each crop type. 1,2-Dichloropropane was recommended for mixed vegetables, berries, and potatoes in 1972 and mixed vegetables, fruit trees, and nursery crops in 1985. 1,2-Dichloropropane has also been used on tobacco fields.

### 5.2.3 Recommendations For Amherst

About 50 percent of the potable water supplied by the Amherst Water Division originates from town wells. The Water Division's wells are located in the area where contamination was detected. The potential for future contamination of the wells in the area exists since the area in question is still being used for agricultural purposes.

Since the vast majority of residents in Amherst receive their potable water from the Amherst Water Division, the threat of consumption of agricultural chemical contaminated water in excess of IDWG limit is small since the Water Division should be able to monitor for and detect contamination and implement corrective measures prior to distribution of the water to the populace.

The Amherst Water Division should continue to monitor their wells at least annually in the Lawrence Swamp area since all of the wells are near active agricultural areas. In addition, the Water Division should consider expanding the list of chemicals to be sampled for.

The Amherst Water Division should consider implementing a study as described in the beginning of Section 5, to determine the source of contamination in their well.

Private wells located along the central portion of Flat Hills Road should be sampled since they are located in a cultivated field area. The Agricultural Land Use overlays show that this area has been used to grow mixed vegetables and harvested grasses in 1985 and was tilled in 1972.

Sampling of private wells located in the Russelville Road area should continue since they are located in a cultivated field area. The 1972 and 1985 Agricultural Land Use overlays show that fields in this general area have been used to grow corn, mixed vegetables, and harvested grasses.

As shown on Table 2-3, the list of chemicals recommended by The New England Agricultural Extension Service for the crops is extensive. Prior to sampling for any chemicals, surveys of chemical usage on nearby fields should be made to determine which chemicals to sample for.

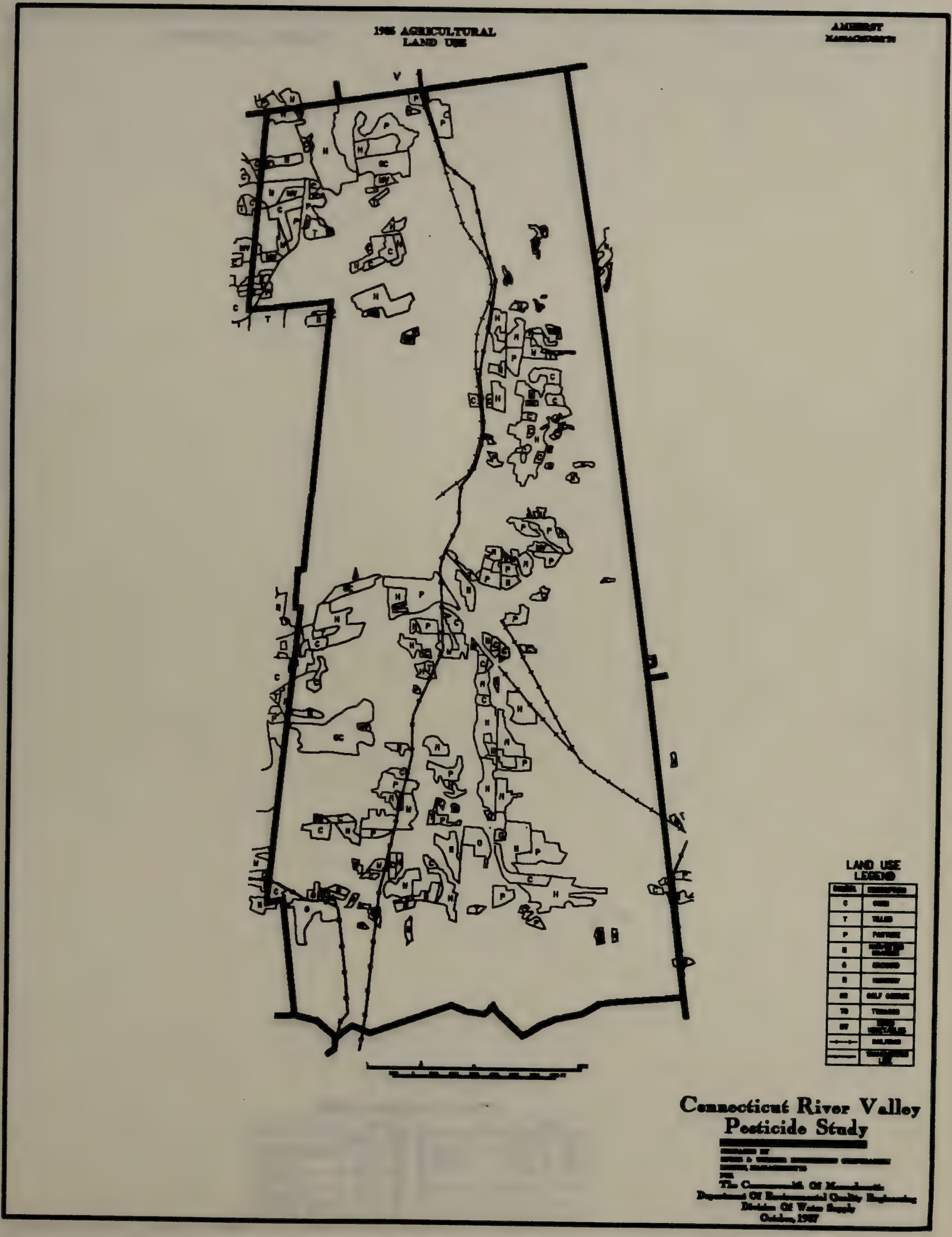
TABLE 5-2

AMHERST
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| CROP | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | Difference 1985-1972 | % Change |
| Corn | 800 | 12 | 358 | 12 | 442 | -55 |
| Pasture | 1953 | 29 | 667 | 22 | -1286 | -66 |
| Tilled | 3349 | 50 | 40 | 1 | -3309 | -99 |
| Harvested Grasses | 0 | 0 | 1632 | 53 | 1632 | -- |
| Tobacco | 19 | <1 | 0 | 0 | -19 | -100 |
| Orchard | 321 | 5 | 23 | 1 | -298 | -93 |
| Mixed Vegetables | 94 | 1 | 106 | 4 | 12 | 13 |
| Golf Course | 180 | 3 | 236 | 8 | 56 | 31 |
| Nursery | 32 | <1 | 0 | 0 | -32 | -100 |
| TOTAL | 6748 | 100.0 | 3062 | 100 | -3689 | -55 |

| | |
|---|---|
| Area of Town | 17,600 |

Note: Only the land uses listed above were mapped. Urban areas, forest land, etc. was not included.

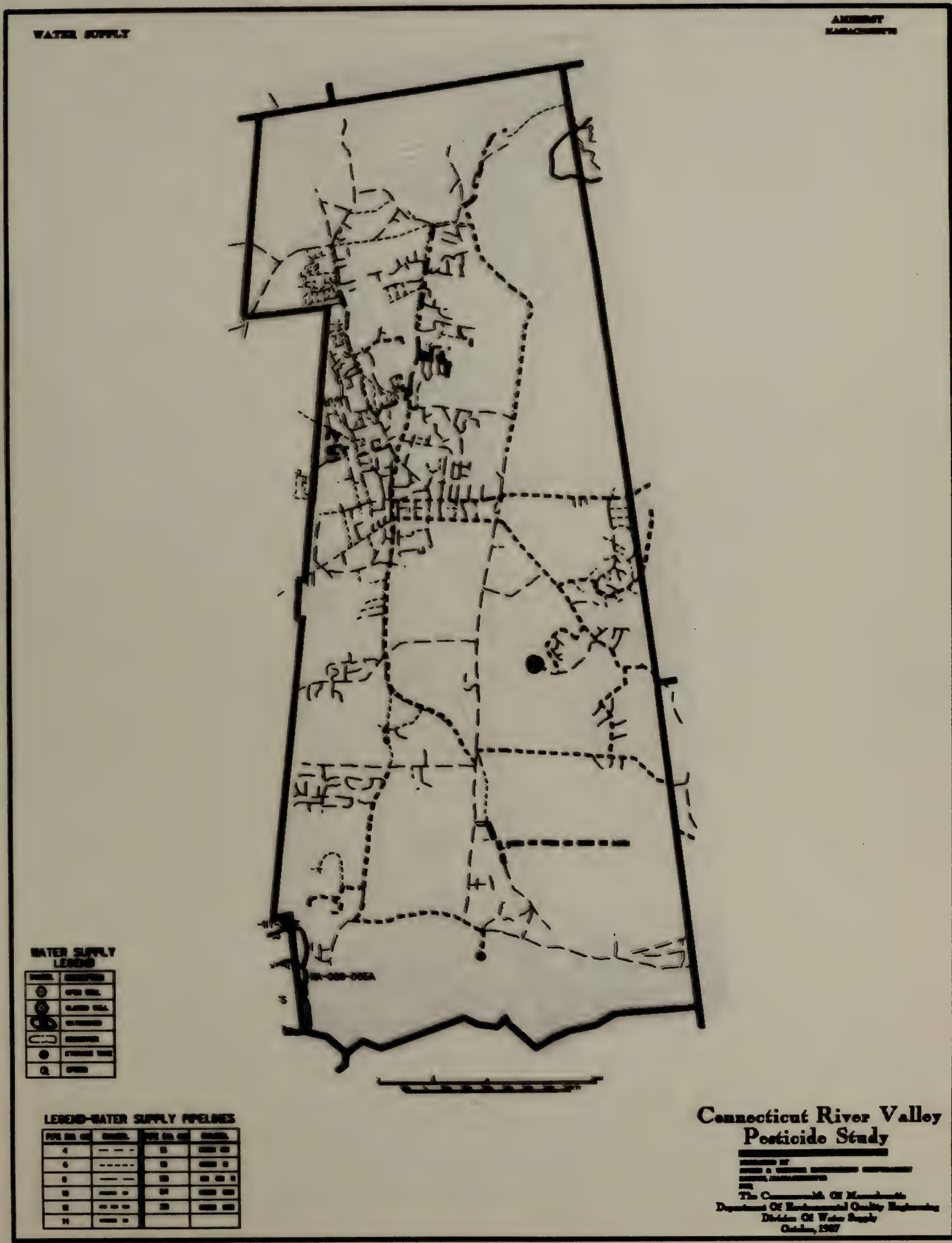


AGRICULTURAL
LAND USE
AMHERST
LAND USE
LEGEND
Connecticut River Valley
Pesticide Study


AGRICULTURAL CHEMICALS
- 030
LEGEND-AGRICULTURAL CHEMICALS
ETHYLENE
ALACHLOR
Connecticut River Valley
Pesticide Study


# Connecticut River Valley Pesticide Study

Department Of Environmental Quality Engineering
Division Of Water Supply


WATER SUPPLY
WATER SUPPLY LEGEND
LEGEND-WATER SUPPLY PIPELINES
Connecticut River Valley
Pesticide Study


North Amherst
AMHERST
Factory Hollow
AMHERST
Lawrence

## 5.3 BELCHERTOWN

### 5.3.1 Agriculture Land Use

Between 1972 and 1985 the town of Belchertown saw a reduction in the area of its land committed to agricultural production of over 1,896 acres or 40 percent.

The area committed to agriculture in Belchertown in 1972 represented 14 percent of total town land area. The major portion (40 percent) of these land uses types were identified as Tilled. (Table 5-3 lists acreages for each of the land use classifications mapped in this study in Belchertown.) Considering that the photographs were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (Mixed Vegetables) without chlorophyll sensitive film.

Corn was the next most common crop in Belchertown in 1972 and was grown on about 7 percent of the total area committed to agriculture. Orchards accounted for 5 percent of the total, with Nurseries and Golf Courses having 4, and 1 percents, respectively. Tobacco was not represented at all.

By 1985, land use in the study area had shifted considerably. At that time only 8 percent of the overall land in Belchertown remained committed to agriculture. The total area of farmland was down to 2,825 acres: a drop of 1,896 acres or 40 percent from the 1972 total.

Within Belchertown, the Tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of Till is still inflated, however, over the normal mid-summer conditions because of the late September photography. The land use classifications most likely to be affected by this situation includes Corn, Harvested Grasses and Mixed Vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall and land use delineation is, however, far more accurate and precise than that made for 1972. Harvested Grasses is the major agricultural type and represents about 42 percent of the land area mapped in Belchertown. This area may, however, include winter wheat due to the end of season photography date. Pasture, Tilled and Mixed Vegetables were the next most important agricultural land uses with 20, 16 and 14 percent, respectively, of the mapped land in Belchertown dedicated to their production. Corn, Golf Courses and Nurseries represented an additional 4, 3 and 2 percent of the mapped area, respectively. Orchards and Tobacco were not represented at all.

### 5.3.2 Water Supply and Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering

(DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. A minority of samples were taken and analyzed by others. Within the 20 town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Belchertown, two sites were sampled with neither site having a positive result.** Table 4-1 lists the sample locations with the sample results.

The public water supply overlay was developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlay shows location of groundwater and surface waters for both community and noncommunity supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlays also show the distribution systems for the public water supplies.

Approximately 40 percent of the population in Belchertown receives their potable water from a public source. Belchertown has several sources of public water. The majority of public water is supplied by the Belchertown Water District and the Belchertown State School. The Water District obtains its water from one well field. The State School obtains its water from one well field. Small sections of Belchertown also receive water from Amherst, the Bondsville F&W district, and the Three Rivers Fire District. Belchertown also has two sources of noncommunity public water. These are the Pine Valley Mobile Home development and the Sports Haven Trailer Park which supply their facilities only.

The Agricultural Land Use overlays indicate that the Water District and State School wells are near agricultural activity. Also, the Bondsville F&W District has wells in Belchertown which are near agricultural activity.

## 5.3 Recommmendation for Belchertown

The majority of Belchertown's population receives their potable water from groundwater sources. Those receiving public-supplied potable water should have less of a chance of receiving contaminated water, since the water should be monitored and any contamination found remedied before the water is distributed. Portions of Belchertown are actively farmed so private wells in those areas should be sampled for contamination.

The Belchertown Water District and the Belchertown State School should monitor their well fields for agricultural chemical contamination. The 1972 and 1985 Agricultural Land Use overlays show that fields in their general area have been used to grow some harvested grasses and mixed vegetables. The overlays also show tilled fields.

The sampling program in Belchertown should be expanded to areas of agricultural activity where public water does not exist. These areas include:

- Eastern Belchertown south of Route 9
- The whole southern section of the town south of the Chicopee Valley Aqueduct
- The Laurence Swamp Area
- Bay road area near Metacomet Lake
- Beardman Street Area
- Bondsville F&W district wells

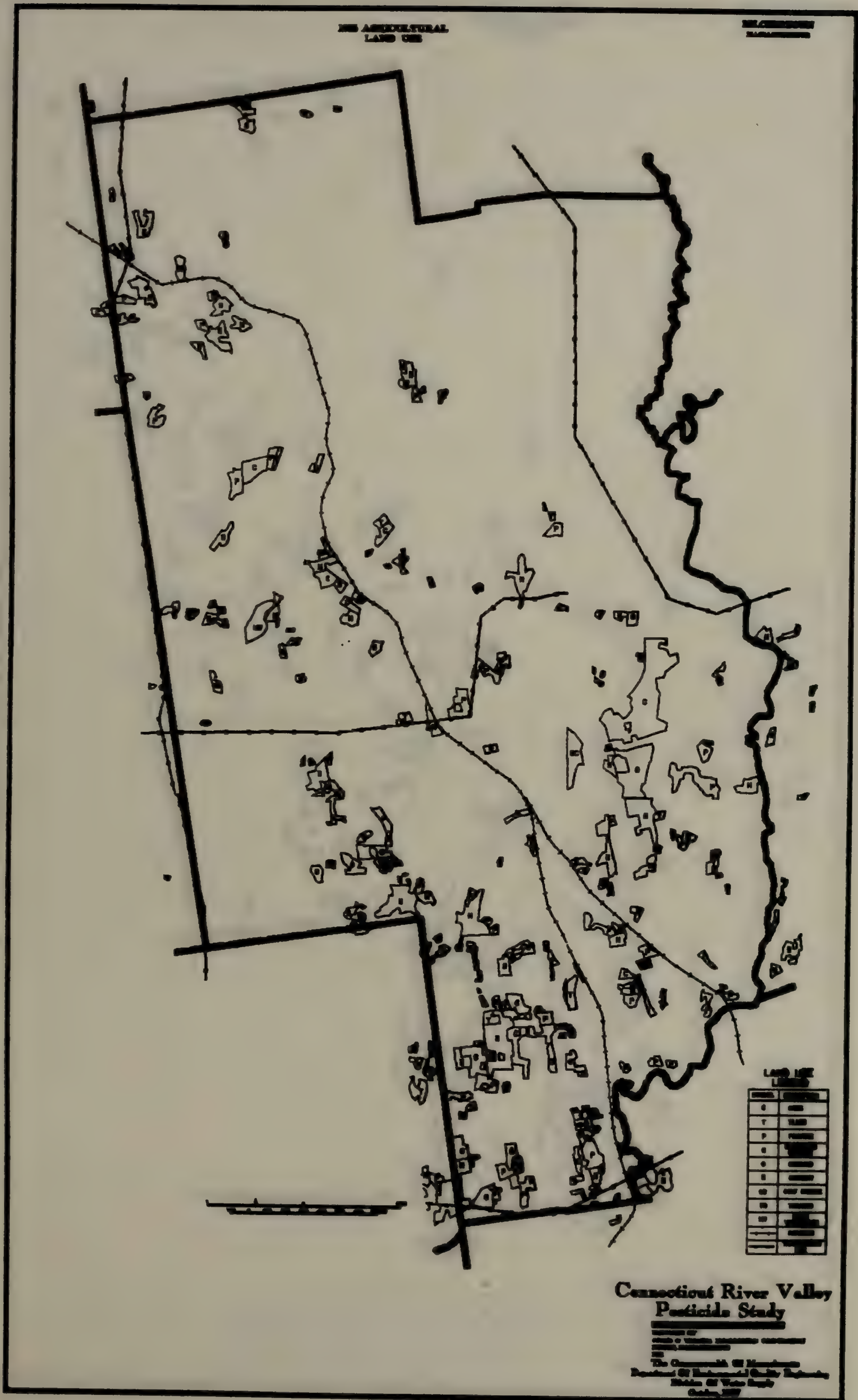
As shown on Table 2-3, the list of chemicals recommended by the New England Agriculture Extension Service for the crops grown in these areas is extensive. Prior to sampling for these chemicals, surveys of chemical usage on nearby fields should be made to determine which chemicals to sample for.

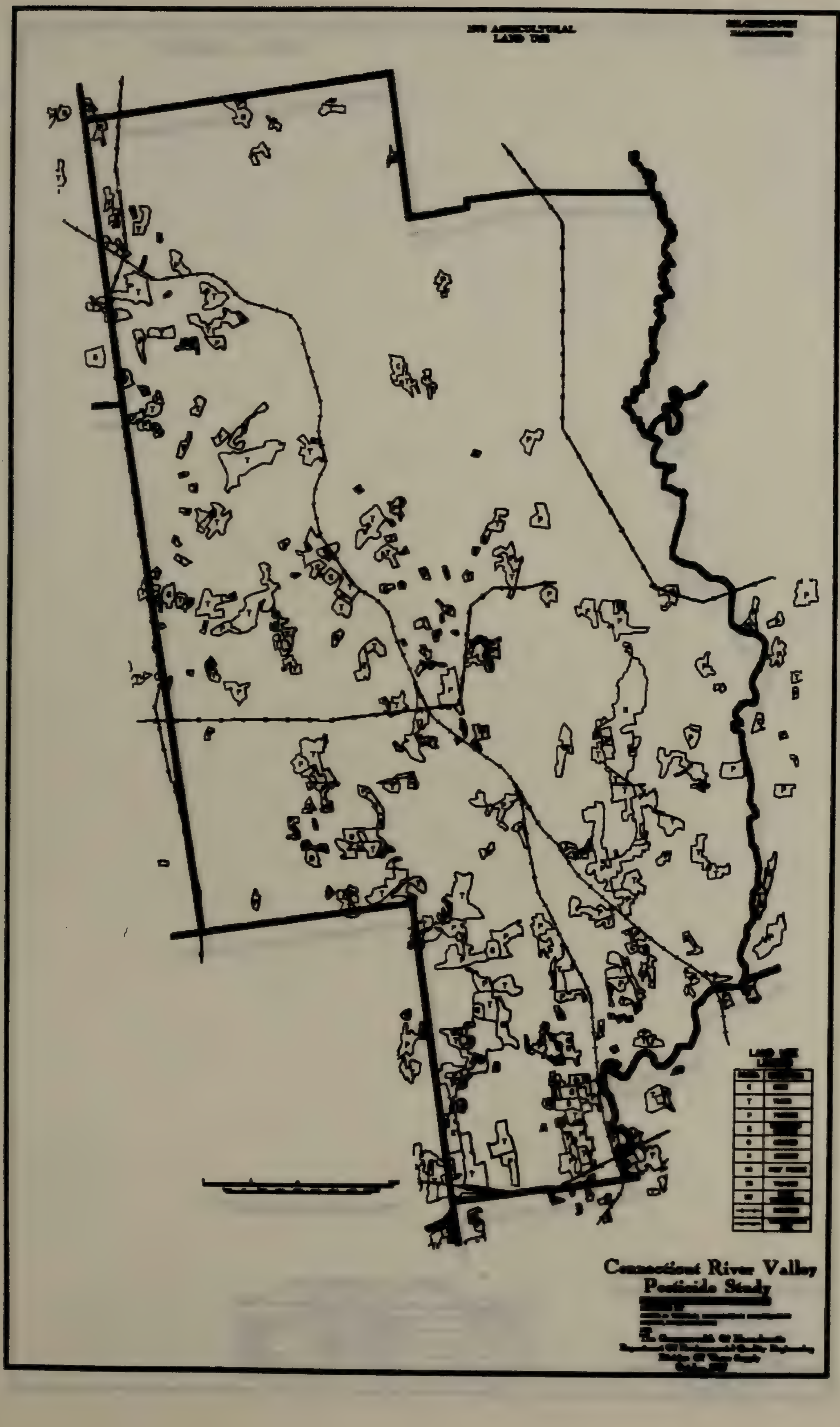
TABLE 5-3

BELCHERTOWN
LAND USE
1972 AND 1985

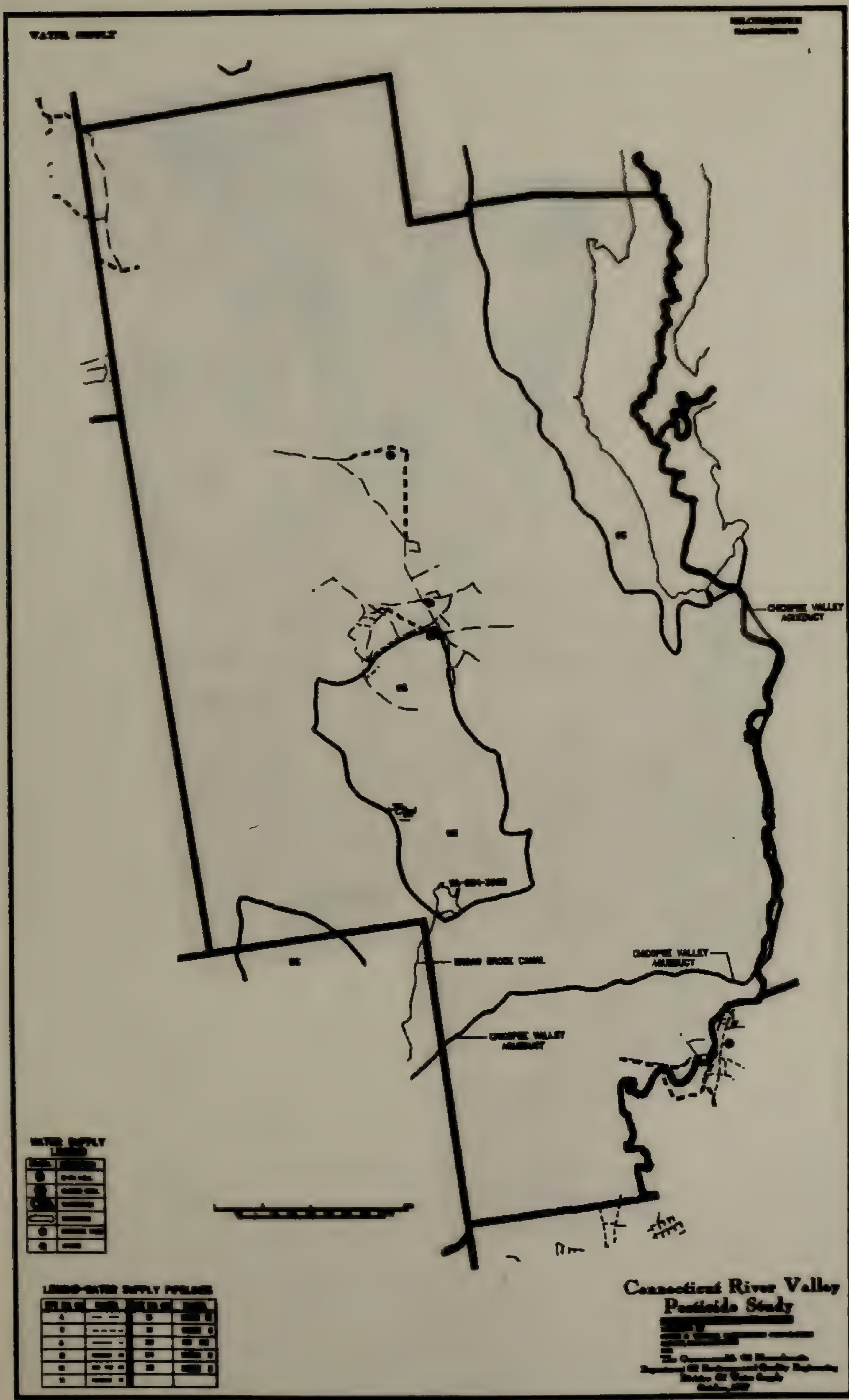
| CROP | 1972 ACRES | 1972 % OF MAPPED AREA | 1985 ACRES | 1985 % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
|---|---|---|---|---|---|---|
| Corn | 348 | 7 | 103 | 4 | -245 | -70 |
| Pasture | 1884 | 40 | 571 | 20 | -1313 | -70 |
| Tilled | 2052 | 44 | 453 | 16 | -1599 | -78 |
| Harvested Grasses | 0 | 0 | 1178 | 42 | 1178 | -- |
| Tobacco | 0 | 0 | 0 | 0 | 0 | -- |
| Orchard | 215 | 5 | 0 | 0 | -215 | -100 |
| Mixed Vegetables | 5 | <1 | 404 | 14 | 399 | 7980 |
| Golf Course | 33 | 1 | 75 | 3 | 42 | 127 |
| Nursery | 184 | 4 | 41 | 2 | -143 | 78 |
| TOTAL | 4721 | 100 | 2825 | 100.0 | -1896 | -40 |
| Area of Town | 33,728 | | | | | |

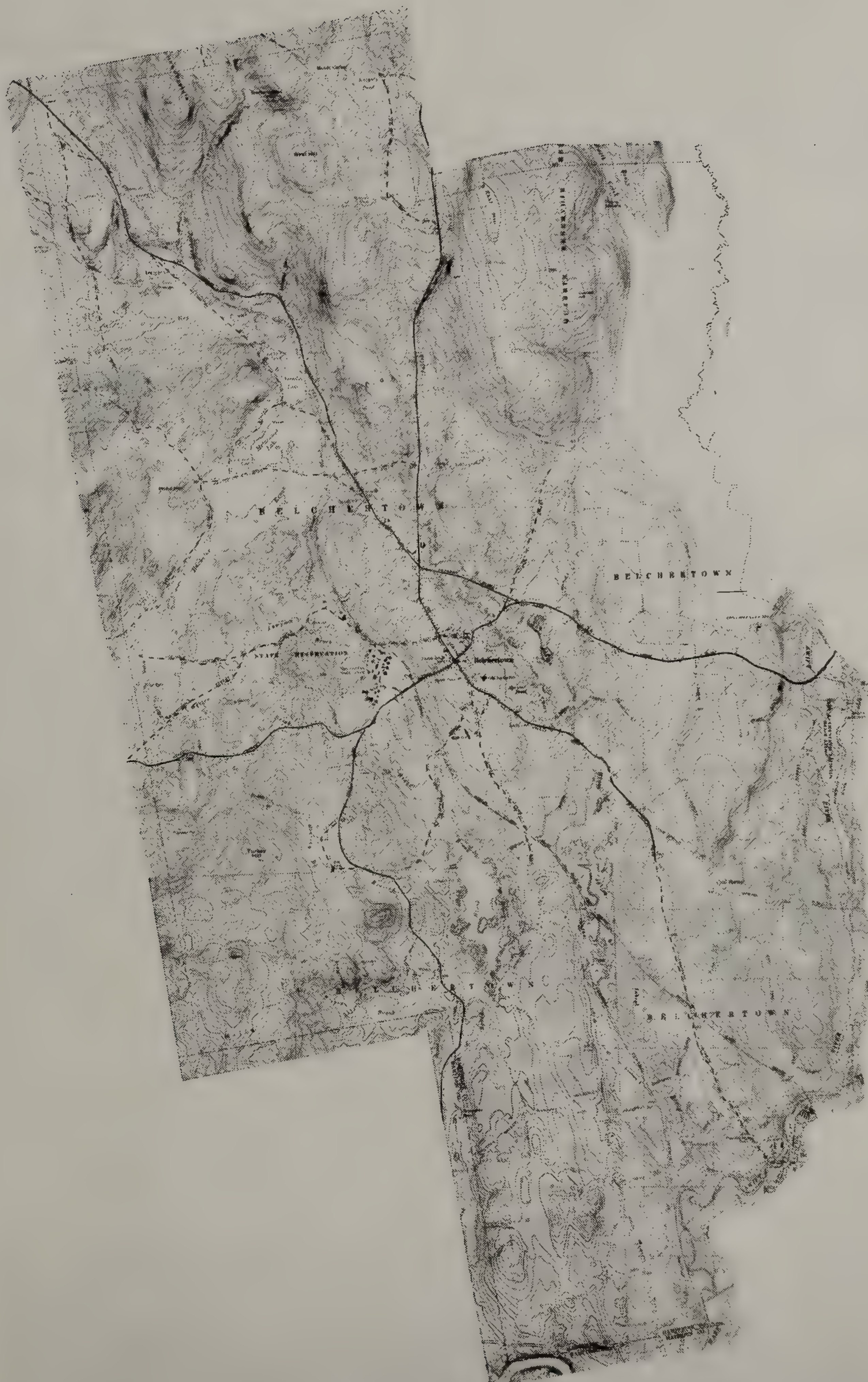
Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. was not included.


Connecticut River Valley
Pesticide Study


Connecticut River Valley
Pesticide Study


Connecticut River Valley
Pesticide Study


CHICOPEE VALLEY AQUEDUCT
BROAD BROOK CANAL
CHICOPEE VALLEY AQUEDUCT
CHICOPEE VALLEY AQUEDUCT
Connecticut River Valley
Pesticide Study


BELCHERTOWN
BELCHERTOWN
STATE RESERVATION
BELCHERTOWN

## 5.4 BERNARDSTON

### 5.4.1 Agricultural Land Use

Between 1972 and 1985 the town of Bernardston saw a reduction in the area of its land committed to agricultural production of over 687 acres or 28 percent.

The area committed to agriculture in Bernardston in 1972 represented 16 percent of total town land area. The major portion (45 percent) of the land use types were identified as tilled. (Table 5-4 lists acreages for each of the land use classifications mapped in this study in Bernardston.) Considering that the photographs used for this study were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (mixed vegetables) without chlorophyll sensitive film.

Corn was the next most common crop and was grown on about 19 percent of the total area committed to agriculture. Nurseries and orchards accounted for less than 1 percent each of the total, with tobacco, mixed vegetables and golf courses not represented at all.

By 1985 only 12 percent of the overall land in Bernardston remained committed to agriculture. The total area of farmland was down to 1,732 acres, a drop of 687 acres or 28 percent from the 1972 total.

Within Bernardston, the tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of till is still inflated, however, over the normal midsummer conditions because of the late September photography. The land use classifications most likely to be affected by this situation include corn, harvested grasses and mixed vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall land use delineation is, however, far more accurate and precise than that made for 1972. Pasture and harvested grasses are the major agricultural types and represent about 41 and 37 percent respectively of the land area mapped in Bernardston. Harvested grasses may, however, include winter wheat due to the end of season photography date. Corn, tilled and golf courses were the next most important agricultural land uses with 10, 6 and 5 percent, respectively, of the land in Bernardston dedicated to their production. Mixed vegetables represented an additional 1 percent of the mapped area. Nurseries, orchards and tobacco were not represented at all.

### 5.4.2 Water Supply and Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. **In Bernardston, two sites were sampled with neither site**

**having a positive result.** Table 4-1 lists the sample locations with the sample results.

The public water supply overlays were developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of groundwater and surface waters for both community and noncommunity supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlays also show the distribution systems for the public water supplies.

Approximately 70 percent of the population in Bernardston receives their potable water from a public source. Bernardston has three sources of public water. The majority of public water is supplied by the Bernardston F&W District which obtains its water from two wells. Bernardston also has two sources of noncommunity public water. These are the Mount Herman School and Purple Meadows Campground which supply their facilities only. Both of the F&W District wells have been tested for Ethylene Dibromide and 1,2-Dichloropropane with neither well having a positive result. These two wells are the only DEQE sampling program sample sites in Bernardston.

### 5.4.3 Recommendations for Bernardston

The Bernardston F&W District wells are adjacent to active agricultural activity. The 1972 and 1985 Agricultural Land Use overlays show that fields in this general area have been used to grow harvested grasses, corn, and mixed vegetables. Tilled fields are also shown. Because the F&W District wells are relatively shallow, the District should continue to sample their wells for agricultural chemical contamination at least annually. This District should also consider expansion of the sampling program to include additional agricultural chemicals.

The sampling program should be expanded to portions of Bernardston where agricultural activity is occurring and the only source of potable water is from private wells. These areas include:

North Bernardston

East and southeast of Ball Mountain

The 1972 and 1985 Agricultural Land Use overlays show that fields in this general area have been used to grow corn and harvested grasses. The overlays also show tilled fields.

The sampling program should include chemicals that are recommended for the crops normally grown in the areas of concern. From Table 2-3, the list of chemicals recommended by the New England Agricultural Extension Service for corn and harvested grass crops is extensive. Prior to sampling for any chemicals, surveys of chemical usage on nearby fields should be made to determine which chemicals to sample for.

Essentially all of Bernardston's potable water is supplied from ground water. The majority of residents in Bernardston receive their potable water from the F&W District. Consequently, the threat of consumption of

agricultural chemical contaminated water in excess of the state IDWG is small since the F&W District should be able to monitor for and detect contamination and implement corrective measures prior to distribution.

TABLE 5-4

BERNARDSTON
LAND USE
1972 AND 1985

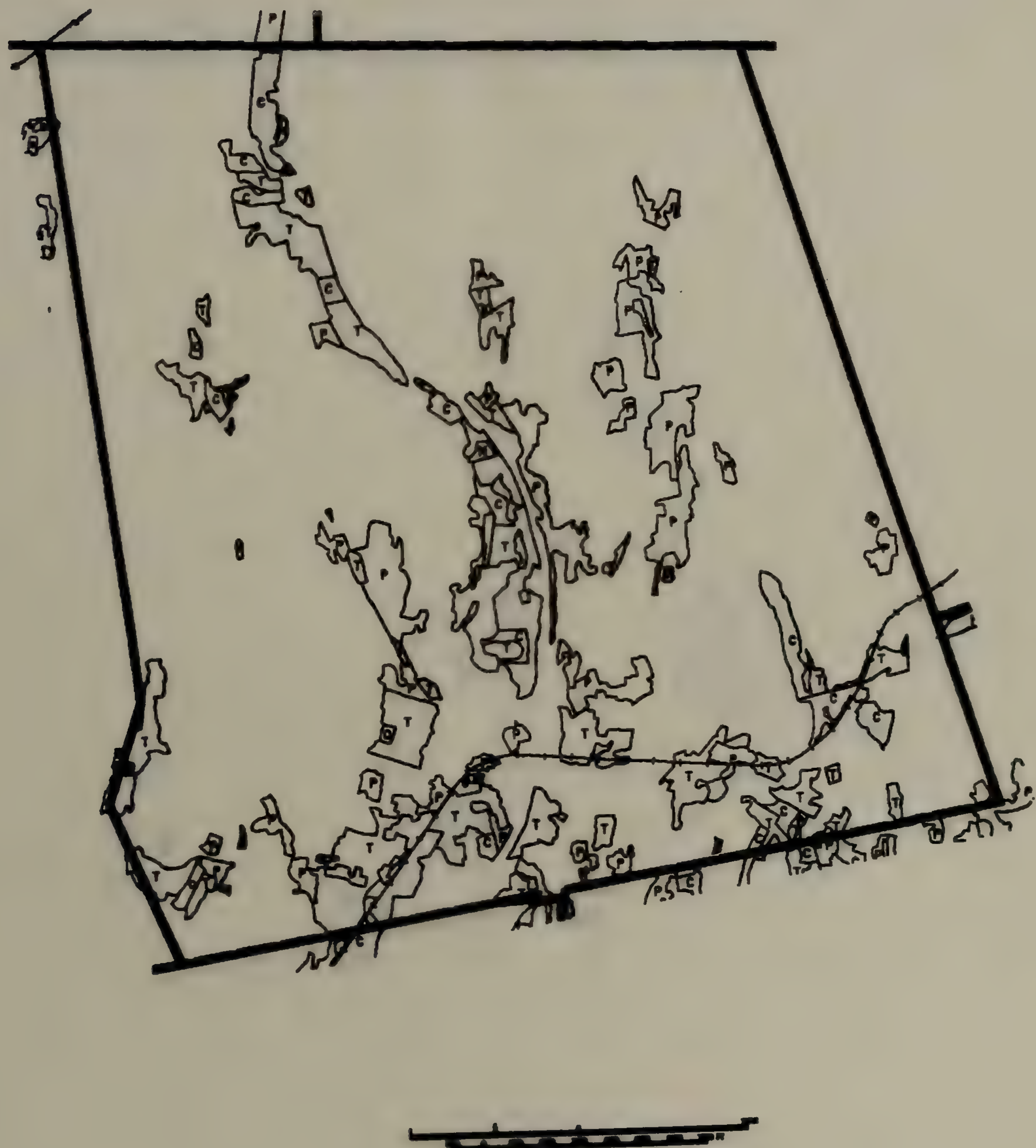
| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| CROP | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
| Corn | 458 | 19 | 174 | 10 | -284 | -62 |
| Pasture | 852 | 35 | 703 | 41 | -149 | -18 |
| Tilled | 1091 | 45 | 112 | 6 | -979 | -90 |
| Harvested Grasses | 0 | 0 | 634 | 37 | 634 | - |
| Tobacco | 0 | 0 | 0 | 0 | 0 | - |
| Orchard | 8 | <1 | 0 | 0 | -8 | -100 |
| Mixed Vegetables | 0 | 0 | 21 | 1 | 21 | - |
| Golf Course | 0 | 0 | 88 | 5 | 88 | - |
| Nursery | 10 | <1 | 0 | 0 | -10 | -100 |
| TOTAL | 2419 | 100 | 1732 | 100 | -687 | -28 |
| Area of Town | 14,976 | | | | | |

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.

FOR TOWNS

BERNARDSTON
MASSACHUSETTS

197[illegible] AGRICULTURAL
LAND USE



LAND USE
LEGEND

| [illegible] | [illegible] |
|---|---|
| C | [illegible] |
| T | TILLED |
| P | [illegible] |
| H | [illegible] |
| O | [illegible] |
| N | [illegible] |
| GC | GOLF COURSE |
| TO | [illegible] |
| SV | [illegible] |
| —+—+— | [illegible] |
| ——— | [illegible] |

# Connecticut River Valley Pesticide Study

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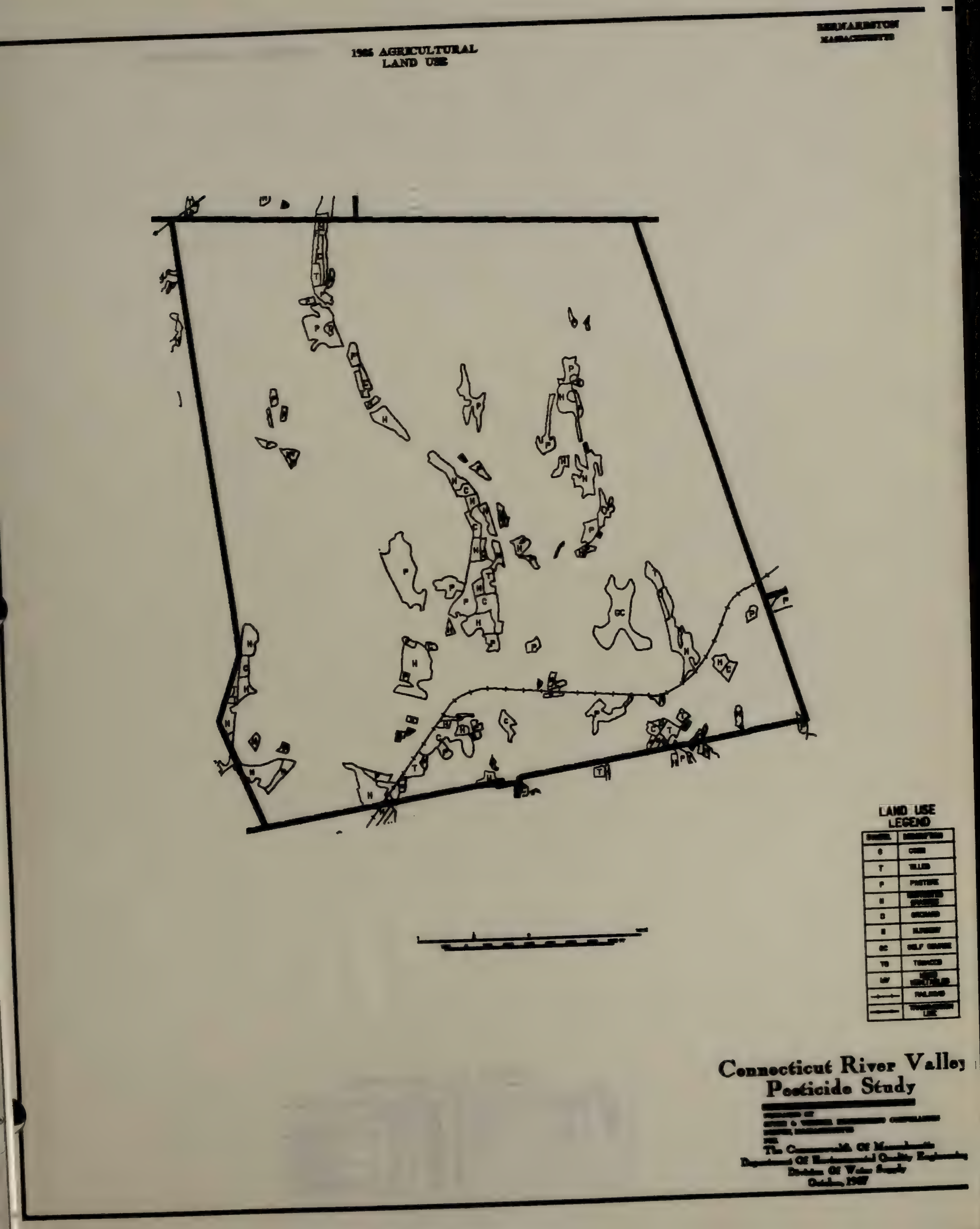
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987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Pesticide Study
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply

AGRICULTURAL CHEMICALS

[illegible]
[illegible]

LEGEND-AGRICULTURAL CHEMICALS

| [illegible] | [illegible] | | [illegible] | [illegible] | |
|---|---|---|---|---|---|
| | [illegible] | [illegible] | | [illegible] | [illegible] |
| [illegible] | | | [illegible] | | |
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# Connecticut River Valley
## Pesticide Study

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[illegible]
[illegible]
[illegible]
[illegible]

WATER SUPPLY

BERNARDSTON
MASSACHUSETTS


WATER SUPPLY LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| | OPEN WELL |
| | CLOSED WELL |
| | WATERSHED |
| | RESERVOIR |
| | STORAGE TANK |
| | SPRING |

LEGEND-WATER SUPPLY PIPELINES

| PIPE DIA (IN) | SYMBOL | PIPE DIA (IN) | SYMBOL |
|---|---|---|---|
| 4 | | 16 | |
| 6 | | 18 | |
| 8 | | 20 | |
| 10 | | 24 | |
| 12 | | 30 | |
| 14 | | | |

# Connecticut River Valle
# Pesticide Study

PREPARED BY
[illegible]
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

## 5.5 DEERFIELD

### 5.5.1 Agricultural Load Use

Between 1972 and 1985 the town of Deerfield saw a reduction in the area of its land committed to agricultural production of over 975 acres or 16 percent. This represented the second lowest (after Granby) percent reduction in agricultural land uses in the 20 town study. The largest overall changes were in land use types which were reclassified using the improved 1985 photography, such as Pasture, Tilled and Harvested Grasses. Other than reclassified areas, Corn and Tobacco had the largest decreases with corn losing 295 acres (14 percent) of its 1972 area. Tobacco bottomed out at zero, having lost all 278 acres. The greatest increase was in the acreage of Orchards, which had a 399 acre increase from 65 to 464 acres under production. Table 5-5 lists acres in agricultural production in 1972 and 1985 by land use type. (The Agricultural Land Use Overlays for 1972 and 1985 show crop distribution within the town.)

The area committed to agriculture in Deerfield in 1972 represented 31 percent of total town land area. The major portion (49 percent) of the agricultural land use types were identified as Tilled. Considering that the photographs were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (Mixed Vegetables) without chlorophyll sensitive film.

Of the remaining pesticide related land use types, Corn was the most common crop and was grown on about 33 percent of the total area committed to agriculture. Tobacco and Orchards accounted for 4 and 1 percent respectively of the total, with Golf Courses and Nurseries covering less than one percent of the agricultural land use types.

By 1985, only 26 percent of the overall land in Deerfield remained committed to agriculture. The total area of farmland was down to 5,286 acres: a drop of 975 acres or 16 percent from the 1972 total.

Within Deerfield, the Tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of Till is still inflated, however, over the normal mid-summer conditions because of the late September photography. The land use classifications most likely to be affected by this situation includes Corn, Harvested Grasses, and Mixed Vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall land use delineation is, however, far more accurate and precise than that made for 1972. Corn and Harvested Grasses are the major agricultural type and represents about 34 and 28 percent respectively of the land area mapped in Deerfield. Harvested Grasses may, however, include winter wheat due to the end of season phography date. Tilled, Orchard and Pasture were the next most important agricultural land uses with 14, 9, and 8 percent respectively of the land in Deerfield dedicated to their production. Mixed Vegetables and Golf Courses represented an additional 6

and 1 percent of the mapped area. Nurseries and Tobacco were not represented at all.

### 5.5.2 Water Supply and Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. A minority of samples were taken and analyzed by others. Within the 20-town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Deerfield, 10 sites were sampled with four sites having a positive result.** Table 4-1 lists the sample locations with the sample results.

The positive results were shown on the overlays as either a light character or a dark character depending on whether or not the concentration measured was over the Massachusetts Interim Drinking Water Guidelines (IDWG). The dark characters represent locations where the concentrations found were over the guidelines. The light characters represent locations where the concentrations were less than or equal to the IDWG **or where the concentrations were at one time over the IDWG but on subsequent sampling were found to be less than the IDWG or not detected at all.** Table 2-4 lists the IDWG for the seven agricultural chemicals. The locations with positive results are labeled with a map number and the well depth, if applicable or available. The map numbers for the locations with positive results are shown on Table 4-2.

The public water supply overlay was developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlay shows location of groundwater and surface waters for both community and noncommunity supplies. The identification numbers used on the overlay are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlay also shows the distribution systems for the public water supplies.

Approximately 90 percent of the population in Deerfield receives their potable water from a public source. Deerfield has four sources of public water. The majority of public water is supplied by the Deerfield Fire District and the South Deerfield Water District. The Fire District obtains its water from four wells and four springs. The South Deerfield Water District obtains its water from two reservoirs. Deerfield also has two sources of noncommunity public water. These are the Eagle Brook School and the Deerfield Academy which supply their facilities only. The Fire District has had one well sampled which showed positive results for 1,2-Dichloropropane and Aldicarb. Neither result was over the IDWG limits. The Water District has a well that was closed in 1984 due to Ethylene Dibromide contamination.

As part of the DEQE sampling program 10 sites (two public wells) in Deerfield have been sampled for Ethylene Dibromide, 1,2-Dichloropropane, and/or Aldicarb. No sampling was done for the other four agricultural

chemicals. The majority of sampling sites are located in the western and southern parts of Deerfield. Out of the 10 sampled locations, five were sampled for Ethylene Dibromide, four were sampled for 1,2-Dichloropropane, and six were sampled for Aldicarb. There were two positive results for Ethylene Dibromide, two positive results for 1,2-Dichloropropane, and one positive result for Aldicarb. One site had a positive result for 1,2-Dichloropropane and Aldicarb. One site had a positive result for 1, 2-Dichloropropane and Aldicarb. Both of the positive results for Ethylene Dibromide were over the IDWG limits, though one site was later sampled and no Ethylene Dibromide was detected. The contamination was found in the southern part of Deerfield, south of Stillwater Bridge. A review of the public water distribution systems indicates that the areas with contamination presently have public water nearby.

Examination of the 1972 and 1985 Agricultural Land Use overlays in the areas where agricultural chemical contamination has occurred indicates that the contamination may be from nearby fields. The land use overlays show that for both areas where contamination occurred, the adjacent land was used to grow corn and harvested grasses in 1985 and was used to grow tobacco and corn in 1972. The overlays also show tilled fields. Table 3 lists the chemicals that are recommended for each crop type. Ethylene Dibromide was recommended for tobacco in 1972 and was not recommended for any crop in 1985. 1,2-Dichloropropane was recommended by the New England Agricultural Extension Service for mixed vegetables, berries, and potatoes in 1972 and mixed vegetables, tree fruit, and nursery crops in 1985. 1,2-Dichloropropane has also been used on tobacco.

The land use overlays show some agricultural activity in the watershed of the South Deerfield Water District Reservoir, which presents the potential for future contamination. The land use overlays also indicate that there is agricultural activity in the vicinity of the Deerfield Academy well, which presents the potential for future contamination.

### 5.5.3 Recommendation for Deerfield

The majority of residents in Deerfield receive their potable water from a public source. Consequently, the threat of consumption of agricultural chemical contaminated water in excess of the IDWG limits is small, since the public water suppliers should be able to monitor for and detect contamination and implement corrective measures prior to distribution of the water. The Deerfield Fire District should continue to monitor their water supplies in the Stillwater area at least annually for agricultural chemical contamination. The Fire District should also consider a study, as discussed in the beginning of Section 5, to determine the source of contamination.

The South Deerfield Water District should monitor its reservoir for contamination from chemicals associated with the agricultural activity in the reservoir's watershed. The land use overlays indicate that the agricultural activity consists of pasture, harvested grasses, and tilled fields.

The Deerfield Academy should monitor its well for agricultural chemicals since its well is adjacent to active farming (as shown on the 1972 and 1985

overlays) which the land use overlays indicate as corn, harvested grasses, and tilled fields.

The sampling program should be expanded to areas where there is active farming and where the only potable water supply is from private wells such as the Upper Road area.

As shown on Table 2-3, the list of recommended chemicals for the crops grown in the various areas is extensive. Prior to sampling, surveys of chemical usage on nearby fields should be made to determine which chemicals to sample for.

TABLE 5-5

DEERFIELD
LAND USE
1972 AND 1985

| CROP | 1972 ACRES | 1972 % OF MAPPED AREA | 1985 ACRES | 1985 % OF MAPPED AREA | DIFFERENCE 1975-1972 | % CHANGE |
|---|---|---|---|---|---|---|
| Corn | 2085 | 33 | 1790 | 34 | -295 | -14 |
| Pasture | 626 | 10 | 435 | 8 | -191 | -30 |
| Tilled | 3049 | 49 | 739 | 14 | -2310 | -76 |
| Harvested Grasses | 0 | 0 | 1500 | 28 | 1500 | -- |
| Tobacco | 278 | 4 | 0 | 0 | -278 | -100 |
| Orchard | 65 | 1 | 464 | 9 | 399 | 614 |
| Mixed Vegetables | 126 | 2 | 320 | 6 | 194 | 154 |
| Golf Course | 24 | <1 | 36 | 1 | 12 | 50 |
| Nursery | 8 | <1 | 2 | 0 | -6 | -75 |
| TOTAL | 6261 | 100 | 5286 | 100 | -975 | -16 |

Total area of town 20,416

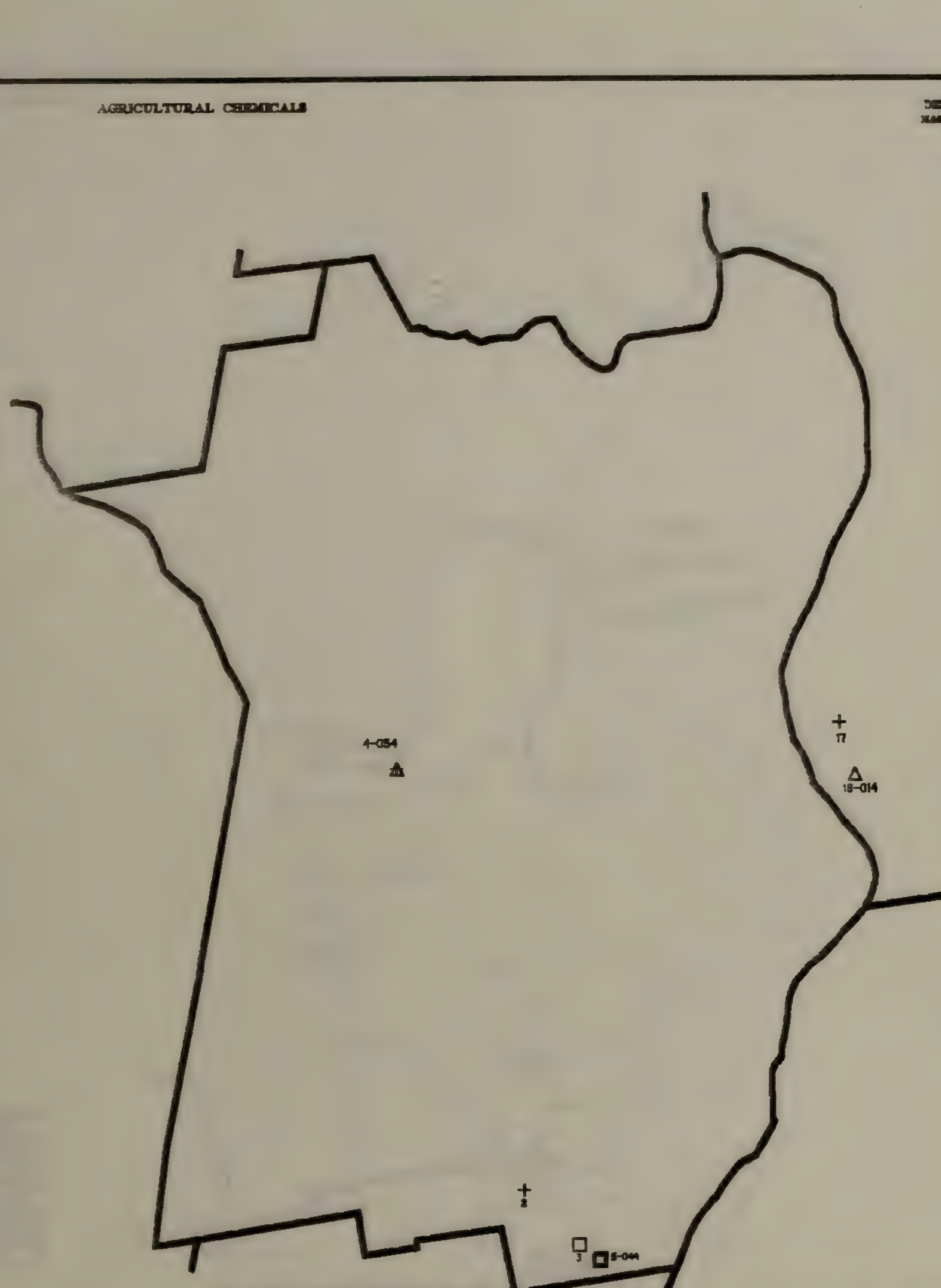
Note: Only the land uses listed above were mapped. Urban areas, forest land, etc. was not included.


AGRICULTURAL
LAND USE
LAND USE
LEGEND
Connecticut River Valley
Pesticide Study


AGRICULTURAL
LAND USE
LAND USE
LEGEND
Connecticut River Valley
Pesticide Study

AGRICULTURAL CHEMICALS

DEERFIELD
MASSACHUSETTS




LEGEND-AGRICULTURAL CHEMICALS

| AGRICULTURAL CHEMICALS | SYMBOL | | AGRICULTURAL CHEMICALS | SYMBOL | |
|---|---|---|---|---|---|
| | [illegible] | [illegible] | | [illegible] | [illegible] |
| ETHYLENE DIBROMIDE | □ | ■ | OXAMYL | ╳ | ╳ |
| ALDICARB | △ | ▲ | DINOSEB | D | D |
| ALACHLOR | ▽ | ▼ | | | |
| CARBOFURAN | ◇ | ◆ | | | |
| [illegible] | + | + | | | |

# Connecticut River Valley Pesticide Study

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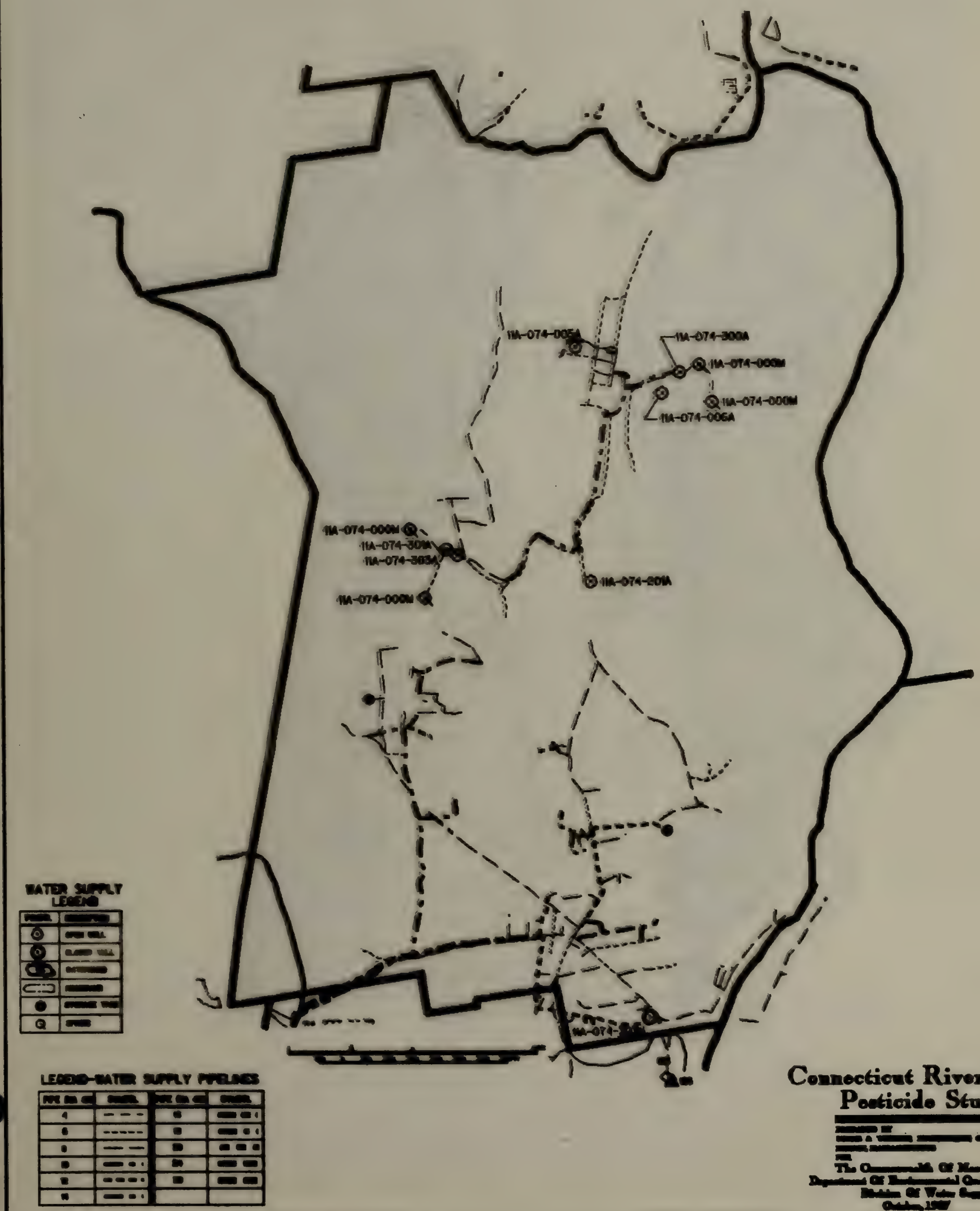
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

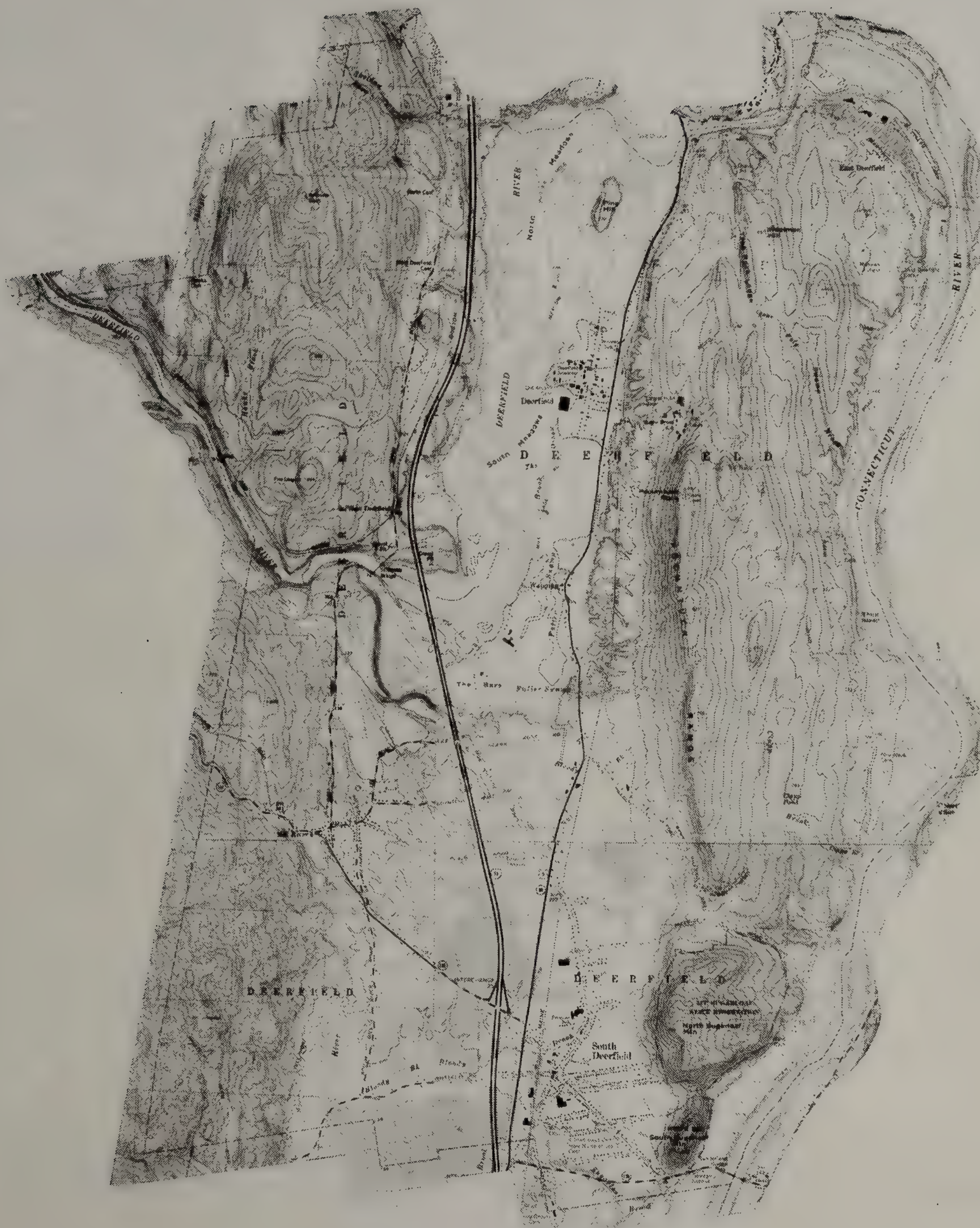
WATER SUPPLY

DEERFIELD
MASSACHUSETTS




# Connecticut River Valley Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987


D E E R F I E L D
DEERFIELD
Deerfield
South Meadows
East Deerfield
CONNECTICUT
RIVER
South Deerfield

## 5.6 EASTHAMPTON

### 5.6.1 Agricultural Land Use

Between 1972 and 1985 the town of Easthampton saw a reduction in the area of its land committed to agricultural production of over 910 acres or 37 percent. While the total land area in Easthampton and in the general Connecticut River Valley dedicated to farming has decreased, the proportional importance of the specific land uses, regionally, changed very little in that 13 year period. For the 20 town region, most of the changes in proportional importance, other than those attributable to the quality or the timing of the photography, are not statistically significant.

The area committed to agriculture in Easthampton in 1972 represented 29 percent of total town land area. The major portion (45 percent) of these land use types were identified as tilled. (Table 5-6 lists acreages for each of the land use classifications mapped in this study in Easthampton.) Considering that the photographs used in this study were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (mixed vegetables) without chlorophyll sensitive film.

Of the remaining pesticide related land use types, corn was the most common crop and was grown on about 37 percent of the total area committed to agriculture. Orchards accounted for 1 percent of the total, with tobacco, golf courses and nurseries not being represented at all.

By 1985, land use in the study area had shifted considerably. At that time only 18 percent of the overall land in Easthampton remained committed to agriculture. The tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of till is still inflated, however, over the normal midsummer conditions because of the late September photography. The land use classifications most likely to be affected by this situation includes corn, harvested grasses and mixed vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall land use delineation is, however, far more accurate and precise than that made for 1972. Corn and harvested grasses are the major agricultural types and represent about 33 and 21 percent, respectively, of the land area mapped in Easthampton. Harvested grasses may, however, include winter wheat due to the end of the season photography date. Pasture and tilled were the next most important agricultural land uses with 18 and 13 percent, respectively, of the land in Easthampton dedicated to their production. orchard, nurseries and mixed vegetables represented an additional 8, 6 and 1 percent of the mapped area. Golf courses and tobacco were not represented at all.

5.6.2 Water Supply and Chemical Contamination

The agricultural chemical contamination overlay was developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20 town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Easthampton, four sites were sampled with two sites having positive results.** Table 4-1 lists the sample locations with the sample results.

The positive results were shown on the overlays as either a light character or a dark character depending on whether or not the concentration measured was over the Massachusetts Interim Drinking Water Guidelines (IDWG). The dark characters represent locations where the concentrations found were over the guidelines. The light characters represent locations where the concentrations were less than or equal to the IDWG **or where the concentrations were at one time over the IDWG but on subsequent sampling were found to be less than the IDWG or not detected at all.** Table 2-4 lists the IDWG for the seven agricultural chemicals. The locations with positive results are labeled with a map number and the well depth, if applicable or available. The map numbers for the locations with positive results are shown on Table 4-2.

The public water supply overlay was developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of groundwater and surface waters for both community and noncommunity supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlays also show the distribution systems for the public water supplies.

Approximately 99 percent of the population of Easthampton receives their potable water from the Easthampton Water Department. The Water Department obtains its water from four wells. The Water Department also has a proposed well for future needs. The four existing wells were sampled for the seven chemicals with two of the wells having positive results for 1,2-Dichloropropane. Both positive results were less than the IDWG limit for 1,2-Dichloropropane. These four sample sites were the only DEQE sampling program sites in Easthampton.

When the land use overlays are examined for the areas where agricultural chemical contamination occurred, the source of contamination is not evident. Both areas have corn and pastureland nearby, and the Lovefield well is near some mixed vegetables. But, the depth of the wells (100 ft and 140 ft) may indicate contamination is from another area entirely. 1,2-Dichloropropane has been recommended for mixed vegetables but not for corn or pastureland.

5.6.3 Recomendations for Easthampton

The majority of Easthampton's potable water is from ground water sources. Since contamination of two of the Water Department wells has occurred, the

potential for continued contamination from agricultural chemicals exists.

Since the vast majority of residents in Easthampton receive their potable water from the Easthampton Water Department, the threat of consumption of water contaminated by agricultural chemicals in excess of the state's IDWG limits is small. The Water Department should be able to monitor for and detect contamination and implement corrective measures prior to distribution of the water in excess of the IDWG limits. Consequently, the Easthampton Water Department should continue to monitor their wells at least annually for the seven agricultural chemicals.

The Water Department should also consider undertaking a study, as described in the beginning of Section 5, to determine the source of their present contamination.

If the source can be determined, then the Water Department could implement measures to better protect their water supply.

TABLE 5-6

EASTHAMPTON
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | Difference 1985-1972 | % Change |
| Corn | 904 | 37 | 517 | 33 | -387 | -43 |
| Pasture | 324 | 13 | 283 | 18 | -41 | -13 |
| Tilled | 1115 | 45 | 206 | 13 | -909 | -82 |
| Harvested Grasses | 0 | 0 | 321 | 21 | 321 | - |
| Tobacco | 0 | 0 | 0 | 0 | 0 | - |
| Orchard | 21 | <1 | 125 | 8 | 104 | 495 |
| Mixed Vegetables | 99 | 4 | 16 | 1 | -83 | 84 |
| Golf Course | 0 | 0 | | 0 | 0 | - |
| Nursery | 0 | 0 | 85 | 6 | 85 | - |
| TOTAL | 2463 | 100 | 1553 | 100 | -910 | 37 |
| Total Town Area | 8,576 | | | | | |

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.

[illegible] AGRICULTURAL LAND USE

EASTHAMPTON


# Connecticut River Valley Pesticide Study

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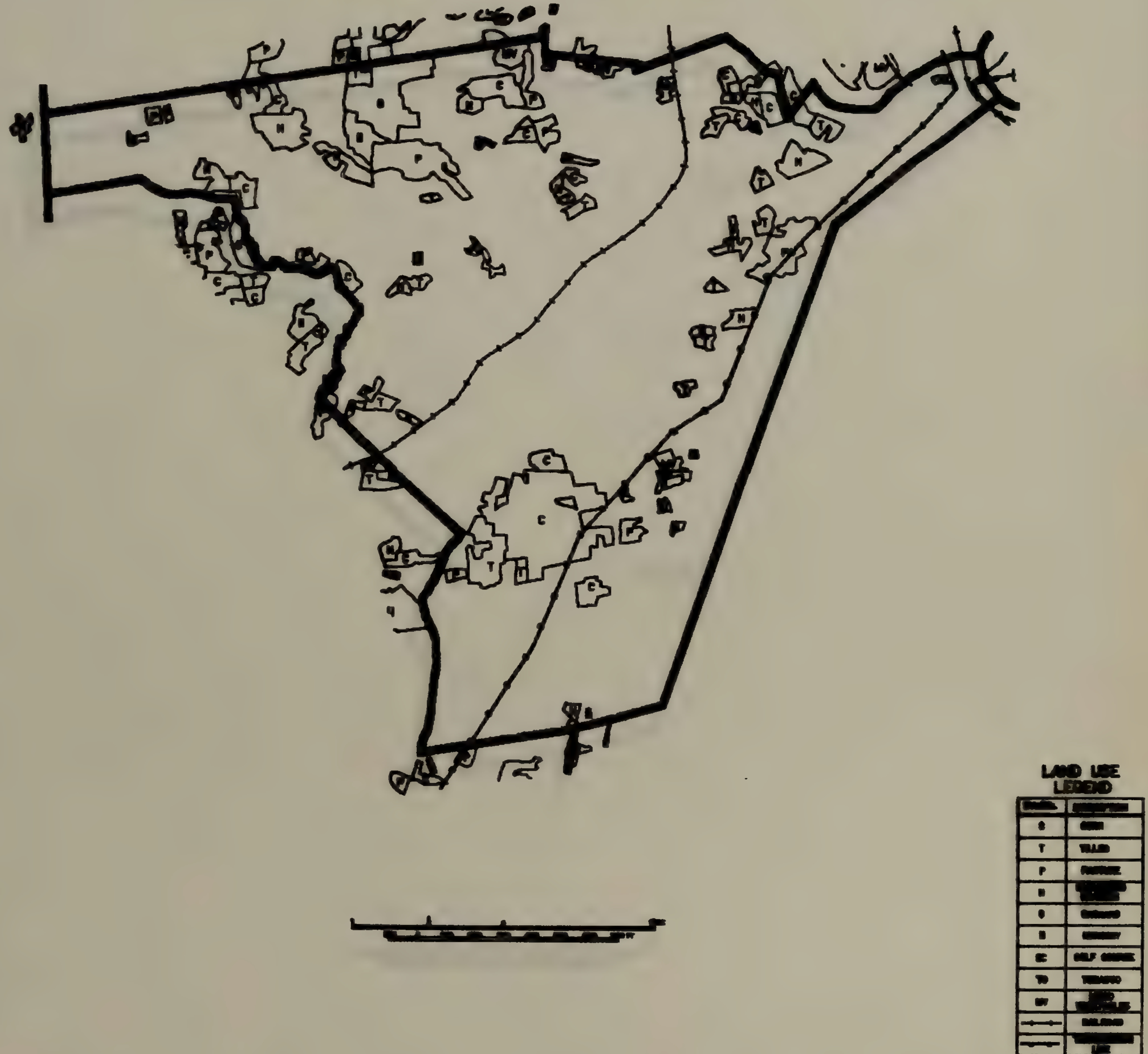
Division Of Water Supply

AGRICULTURAL
LAND USE

EASTHAMPTON




# Connecticut River Valley
# Pesticide Study

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October, 1987

AGRICULTURAL CHEMICALS

EASTHAMPTON
MASSACHUSETTS


LEGEND-AGRICULTURAL CHEMICALS

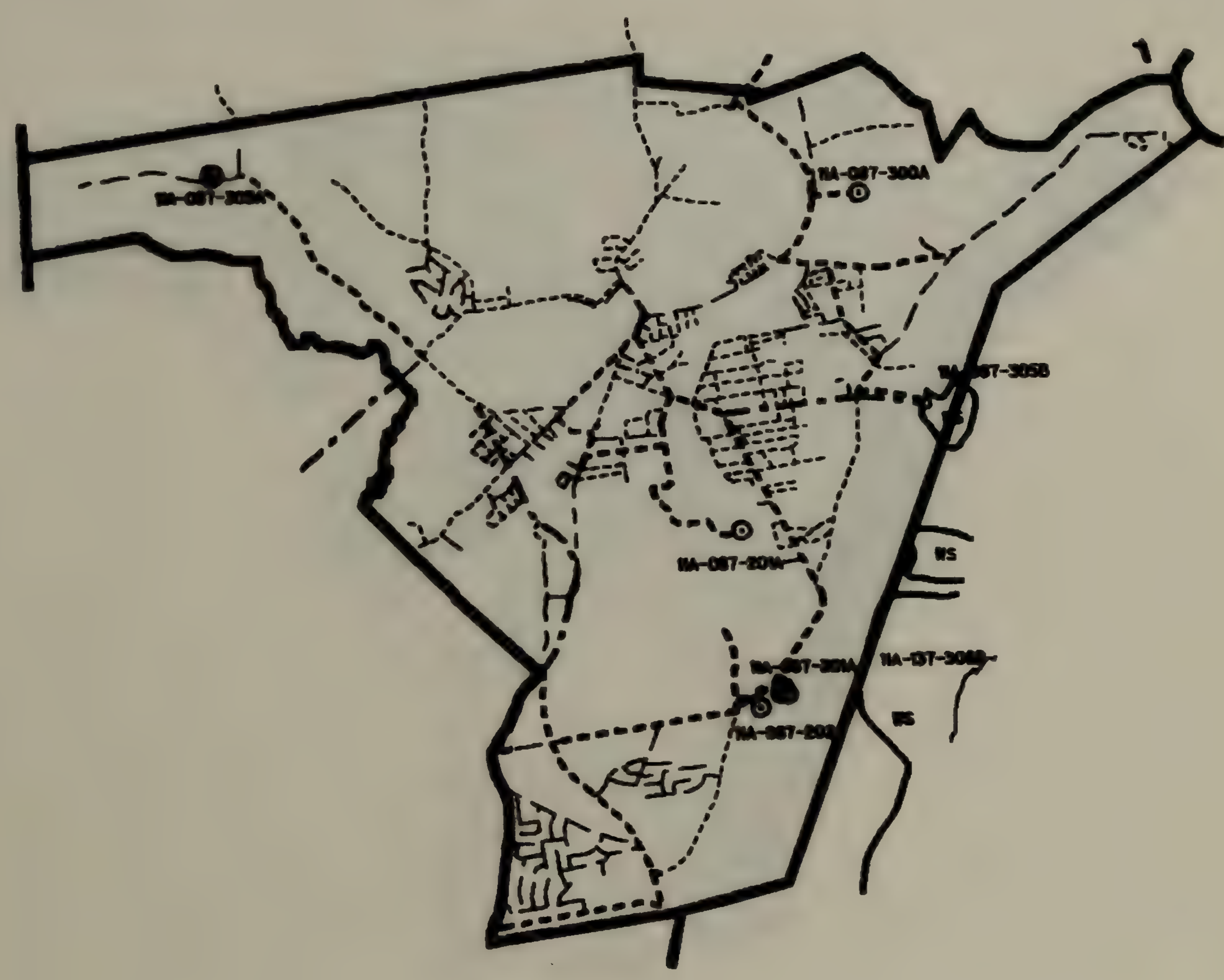
| AGRICULTURAL CHEMICALS | [illegible] | | AGRICULTURAL CHEMICALS | [illegible] | |
|---|---|---|---|---|---|
| | PRESENT | USED | | PRESENT | USED |
| ETHYLENE DIBROMIDE | | | [illegible] | | |
| ALDICARB | | | [illegible] | | |
| ALACHLOR | | | | | |
| CARBOFURAN | | | | | |
| 1,2-DICHLOROPROPANE | | | | | |

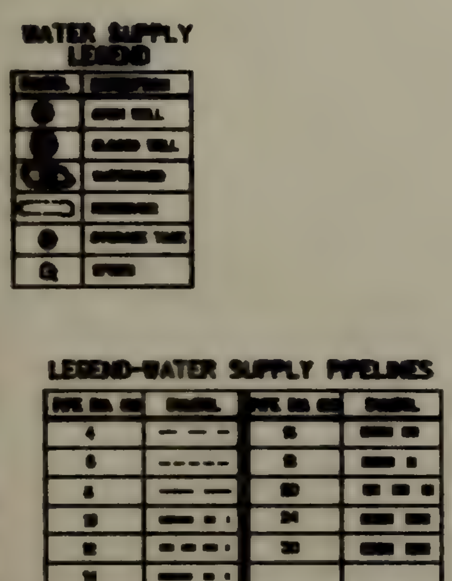
# Connecticut River Valley Pesticide Study

PREPARED BY
[illegible]
[illegible]
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

WATER SUPPLY

EASTHAMPTON
MASSACHUSETTS




# Connecticut River Valley Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987


RIVER
RIVER
EASTHAMPTON

## 5.7 GILL

### 5.7.1 Agricultural Land Use

Between 1972 and 1985, the town of Gill saw a reduction in the area of its land committed to agricultural production of over 1253 acres or 44 percent.

The area committed to agriculture in Gill in 1972 represented 30 percent of total town land area. The major portion (37 percent) of the land use types were identified as Tilled. (Table 5-7 lists acreages for each of the land use classifications mapped in this study in Gill.) Considering that the photographs used in this study were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (Mixed Vegetables) without chlorophyll sensitive film.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and the lack of chlorophyll information. These included Pasture, Harvested Grasses, Tilled and Mixed Vegetables. The difficulties in separating these land use types did not, however, lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide related land use types, Corn was the most common crop and was grown on about 33 percent of the total area committed to agriculture. Golf Courses accounted for 2 percent of the total. Orchards and Nurseries used less than 1 percent of the agricultural land use areas for either type, and Tobacco was not found at all.

By 1985, only 17 percent of the overall land in Gill remained committed to agriculture. The total area of farmland was down to 1,577 acres: a drop of 1253 acres or 44 percent from the 1972 total.

Within Gill, the Tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of Till is still inflated, however, over the normal midsummer conditions because of the late September photography. The land use classifications most likely to be affected by this situation includes Corn, Harvested Grasses and Mixed Vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall and land use delineation is, however, far more accurate and precise than that made for 1972. Corn, Pasture and Harvested Grasses are the major agricultural type and represents about 34, 32 and 26 percent, respectively, of the land area mapped in Gill. Harvested Grasses may, however, include winter wheat due to the end of season photography date. Tilled, Golf Courses, Mixed Vegetables and Orchards were the smallest active categories with 4, 3, 1 and less than 1 percent of the land in Gill under that form of management. Nurseries and Tobacco were not found at all.

5.7.2 Water Supply and Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). A total of 146 sites had positive results for at least one chemical. **No sites were sampled in Gill.**

The public water supply overlays were developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of goundwater and surface waters for both community and noncommunity supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-1 to determine ownership of the supplies. The overlays also show the distribution systems for the public water supplies.

Approximately 35 percent of the population in Gill receives their potable water from the Riverside Water Department which obtains its water from the Greenfield Water Department. There is also an old spring located in Gill that at one time was used for potable water. This spring is no longer connected to any distribution system.

5.7.3 Recommendations for Gill

Since the majority of the population in Gill receives their potable water from ground water sources, mostly from private wells, there are areas in the town with a substantial amount of agricultural activity which have no public water available. Consequently, the sampling program should be expanded into the following areas:

The east half of Gill
Portions of Gill Road, Main Road, and Center Street
North of the Cascades Area

The 1972 and 1985 Agricultural Land Use overlays show that fields in these areas have been used to grow corn, some mixed vegetables, and harvested grasses. The overlays also show pastures and tilled fields. From Table 2-3, the list of chemicals recommended by the New England Agricultural Extension Service for these crops is extensive. Prior to sampling for any chemicals, surveys of chemical usage on nearby fields should be made to determine which chemicals to sample for.

For those residents who receive their water from the Riverside Water Department, the threat of consumption of agricultural chemical contaminated water in excess of the IDWG limits is small since the Greenfield Water Department, which supplies the Riverside Water Department with water, should be able to monitor for and detect contamination and implement corrective measures prior to distribution.

TABLE 5-7

GILL
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
| Corn | 939 | 33 | 530 | 34 | -409 | -44 |
| Pasture | 763 | 27 | 504 | 32 | -259 | -34 |
| Tilled | 1052 | 37 | 69 | 44 | -983 | -93 |
| Harvested Grasses | 0 | 0 | 403 | 26 | -403 | - |
| Tobacco | 0 | 0 | 0 | 0 | 0 | - |
| Orchard | 8 | <1 | 8 | <1 | 0 | 0 |
| Mixed Vegetables | 8 | <1 | 16 | 1 | 8 | 100 |
| Golf Course | 54 | 2 | 47 | 3 | -7 | -13 |
| Nursery | 6 | <1 | 0 | 0 | -6 | -100 |
| TOTAL | 2830 | 100 | 1577 | 100 | -1253 | -44 |

Total Town Area 9,536

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.

1973 AGRICULTURAL
LAND USE

GILL
MASSACHUSETTS

LAND USE
LEGEND

| [illegible] | [illegible] |
|---|---|
| C | CORN |
| T | TILLED |
| P | PASTURE |
| H | [illegible] |
| A | ORCHARD |
| N | NURSERY |
| GC | GOLF COURSE |
| TB | TOBACCO |
| MV | [illegible] |
|  | RAILROAD |
|  | [illegible] |

# Connecticut River Valley Pesticide Study

PREPARED BY
[illegible]
[illegible]
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

1985 AGRICULTURAL
LAND USE

GILL
MASSACHUSETTS


# Connecticut River Valley Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

AGRICULTURAL CHEMICALS

GILL
MASSACHUSETTS

LEGEND-AGRICULTURAL CHEMICALS

| AGRICULTURAL CHEMICALS | SYMBOL | | AGRICULTURAL CHEMICALS | SYMBOL | |
|---|---|---|---|---|---|
| | PRESENT | OVER | | PRESENT | OVER |
| ETHYLENE DIBROMIDE | □ | ■ | OXAMYL | X | X |
| ALDICARB | △ | ▲ | DINOSEB | D | D |
| ALACHLOR | ▽ | ▼ | | | |
| CARBOFURAN | ◇ | ◆ | | | |
| 1,2-DICHLOROPROPANE | + | + | | | |

# Connecticut River Valley Pesticide Study

PREPARED BY
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASSACHUSETTS
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

WATER SUPPLY

GILL
MASSACHUSETTS


WATER SUPPLY LEGEND

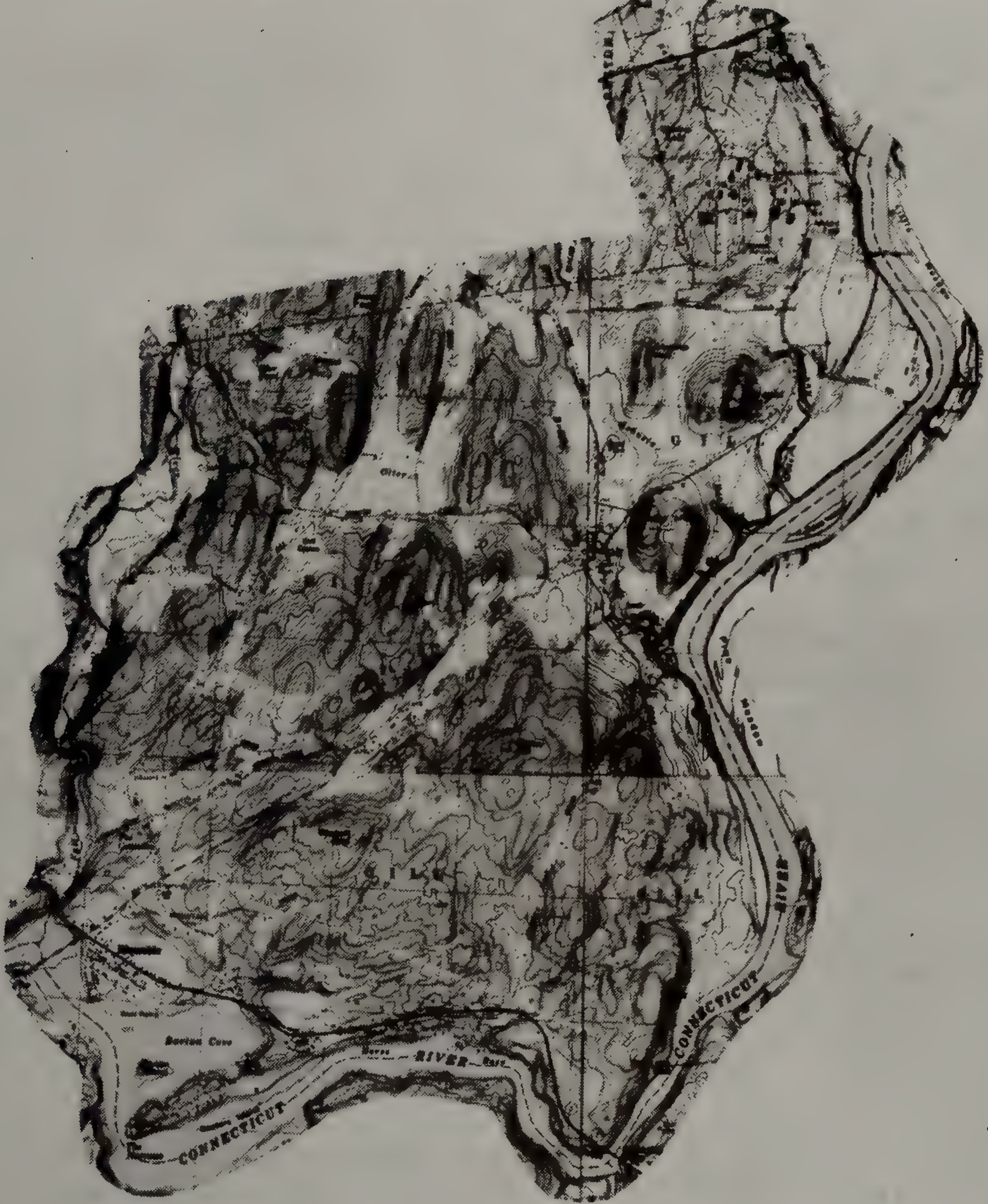
| [illegible] | [illegible] |
|---|---|
| | OPEN WELL |
| | CLOSED WELL |
| | [illegible] |
| | [illegible] |
| | STORAGE TANK |
| | SPRING |

LEGEND-WATER SUPPLY PIPELINES

| PIPE DIA (IN) | [illegible] | PIPE DIA (IN) | [illegible] |
|---|---|---|---|
| 4 | | 16 | |
| 6 | | 18 | |
| 8 | | 20 | |
| 10 | | 24 | |
| 12 | | 30 | |
| 14 | | | |

# Connecticut River Valley Pesticide Study

[illegible]
for
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987


CONNECTICUT
RIVER
CONNECTICUT
RIVER

## 5.8 GRANBY

### 5.8.1 Agricultural Land Use

Between 1972 and 1985 the town of Granby saw a 153 acre or 6 percent reduction in the area of its land committed to agricultural production. This was the lowest reduction in acreage in the entire 20 town study. The largest overall changes were in land use types which were reclassified using the improved 1985 photography, such as pasture, tilled and harvested grasses. Other than reclassified areas, corn had the largest decreases with corn losing 150 acres (45 percent) of its 1972 area. In Granby, most other crops gained (possibly because of the better resolution of the improved photography). Mixed vegetables gained 90 acres (83 percent) and golf courses and orchards gained 69 and 45 acres, respectively. (Table 5-8 lists acreages for each of the land use classifications mapped in this study in Granby.)

The area committed to agriculture in Granby in 1972 represented 15 percent of total town land area. The major portion (64 percent) of the land use types were identified as tilled. Considering that the photographs used in this study were taken in July, this is an unusually high percentage. This high percentage is attributed , in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (mixed vegetables) without chlorophyll sensitive film.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and the lack of chlorophyll information. These included pasture, harvested grasses, tilled and mixed vegetables. It is important to note, however, that the difficulties in separating these land use types did not also lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide-related land use types, corn was the most common crop and was grown on about 13 percent of the total area committed to agriculture. Golf courses accounted for 3 percent of the total and orchards used about 1 percent of the agricultural land use areas. Nurseries and tobacco were not found in either year.

By 1985, only 14 percent of the overall land in Granby remained committed to agriculture. The total area of farmland was down to 2,469 acres: a drop of only 153 acres or 6 percent from the 1972 total.

Within Granby the tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of till is still inflated, however, over the normal midsummer conditions because of the late September photography. The land use classifications most likely to be affected by this situation includes corn, harvested grasses and mixed vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall land use delineation is, however, far more accurate and precise than that made for 1972. Harvested grasses and pasture were the major agricultural type and represents about 46 and 24 percent respectively of the land area mapped in Granby. Harvested grasses may, however, include winter wheat due to the end of season photography date. Tilled and corn were the next most important agricultural land uses with 9 and 7 percent respectively of the land in Granby dedicated to their production. Golf courses, mixed vegetables and orchards represented an additional 6, 5 and 3 percent of the mapped area. Nurseries went from zero to 8 acres and Tobacco was not represented at all.

5.8.2 Water Supply and Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20 town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Granby, 31 sites were sampled with three sites having positive results.** Table 4-1 lists the sample locations with the sample results.

The positive results were shown on the agriculture chemical overlay as either a light character or a dark character depending on whether or not the concentration measured was over the Massachusetts Interim Drinking Water Guidelines (IDWG). The dark characters represent locations where the concentrations found were over the guidelines. The light characters represent locations where the concentrations were less than or equal to the IDWG **or where concentrations were at one time over the IDWG but on subsequent sampling were found to be less than the IDWG or not detected at all.** Table 2-4 lists the IDWG for the seven agricultural chemicals. The locations with positive results are labeled with a map number and the well depth, if applicable or available. The map numbers for the locations with positive results are shown on Table 4-2.

The public water supply overlay was developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlay shows location of groundwater and surface waters for both community and non-community supplies. The identification numbers used on the overlay are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlay also shows the distribution systems for the public water supplies.

Less than 10 percent of the population in Granby receives their potable water from a public source. There are no community water supplies located in Granby, though a small portion of Granby receives its potable water from South Hadley. Granby has four non-community public water supplies, Bachelor Knolls, Elderly Housing, Granby Heights Condominiums, and Mount Hyacinth College, which supply their facilities only.

As part of the DEQE sampling program, 31 sites in Granby were sampled for Aldicarb, Carbofuran, Oxamyl, Alachlor, and/or Dinoseb. Ethylene Dibromide

and 1,2-Dichloropropane were not sampled for. All 31 sites were sampled for Aldicarb. The majority of sampling was along East Street and Lyman Road in central Granby. A few samples were taken in the southwest corner of Granby. Three sample sites had positive results for Aldicarb. All of the positive results were above the IDWG limits. Twelve sites were sampled for Carbofuran, Oxamyl, Alachlor, and Dinoseb: none had positive results. Contamination from Aldicarb was located on the north side of East State Street near the schools.

Examination of the 1972 and 1985 Agricultural Land Use overlays in the area where agricultural chemical contamination occurred, and consideration of the shallow depth of the contaminated wells indicates that the contamination may be from the nearby fields. The land use overlays show that this area was used to grow mixed vegetables, and harvested grasses in 1985; there were also tilled fields and pastures. In 1972, this land was predominantly tilled field. Table 2-3 lists the chemicals that were recommended by the New England Agricultural Extension Service for each crop type. Aldicarb was recommended for potatoes in 1985. Potatoes may have been grown in the tilled fields and some of the pasture lands in previous years.

### 5.8.4 Recommendations for Granby

The majority of the population in Granby receives their potable water from ground water sources. Many sections of Granby are predominantly cultivated farm land which contain the potential for contaminated ground water. Consequently the sampling program should be continued in the central part of Granby and should be expanded to those portions of Granby where the majority of cultivated farm land exists. This includes:

- Most of the Southeastern section of the town
- The Taylor St. - Carver St. section
- The Kendall St. area
- The St. Hyacinths College wells

In 1972 and 1985 Agricultural Land Use overlays show that fields in these areas have been used to grow corn, mixed vegetables, and harvested grasses. The overlays also show tilled fields and pasture. From Table 2-3, the list of chemicals recommended for these crops is extensive. Prior to sampling for any chemicals, surveys of chemical usage on nearby fields should be made to determine which chemicals to sample for.

If contamination is found in additional sections of Granby, the potential for supplying these sections with public water from the South Hadley tie-in to the Chicopee Valley Adueduct should be considered.

TABLE 5-8

GRANBY
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
| Corn | 331 | 3 | 181 | 7 | -150 | -45 |
| Pasture | 489 | 9 | 594 | 24 | 105 | 22 |
| Tilled | 1671 | 64 | 223 | 9 | -1448 | -87 |
| Harvested Grasses | 0 | 0 | 1128 | 46 | 1128 | - |
| Tobacco | 0 | 0 | 0 | 0 | 0 | - |
| Orchard | 25 | 1 | 70 | 3 | 45 | 180 |
| Mixed Vegetables | 23 | 1 | 113 | 5 | 90 | 391 |
| Golf Course | 83 | 3 | 152 | 6 | 69 | 83 |
| Nursery | 0 | 0 | 8 | <1 | 8 | - |
| TOTAL | 2622 | 100 | 2469 | 100 | -153 | -6 |
| Area of Town | 17,792 | | | | | |

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.

AGRICULTURAL
LAND USE

GRANBY

LAND USE
LEGEND

| [illegible] | [illegible] |
|---|---|
| C | [illegible] |
| T | TILLED |
| P | PASTURE |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| GC | [illegible] |
| TO | TOBACCO |
| [illegible] | [illegible] VEGETABLES |
| | [illegible] |
| | [illegible] LINE |

# Connecticut River Valley
# Pesticide Study

[illegible]

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
[illegible]

1986 AGRICULTURAL
LAND USE

GRANBY
MASSACHUSETTS

LAND USE
LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| C | CORN |
| T | TILLED |
| P | PASTURE |
| H | HARVESTED [illegible] |
| O | ORCHARD |
| N | NURSERY |
| GC | GOLF COURSE |
| TB | TOBACCO |
| MV | MIXED VEGETABLES |
| | RAILROAD |
| | TRANSMISSION LINE |

# Connecticut River Valley Pesticide Study

PREPARED BY
[illegible]
[illegible]
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

AGRICULTURAL CHEMICALS

GRANBY
MASSACHUSETTS


LEGEND-AGRICULTURAL CHEMICALS

| AGRICULTURAL CHEMICALS | SYMBOL | | AGRICULTURAL CHEMICALS | SYMBOL | |
|---|---|---|---|---|---|
| | PRESENT | OVER | | PRESENT | OVER |
| ETHYLENE DIBROMIDE | | | OXAMYL | | |
| ALDICARB | | | [illegible] | | |
| ALACHLOR | | | | | |
| CARBOFURAN | | | | | |
| 1,2-DICHLOROPROPANE | | | | | |

Connecticut River Valley
Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

WATER SUPPLY

GRANBY
MASSACHUSETTS


WATER SUPPLY LEGEND

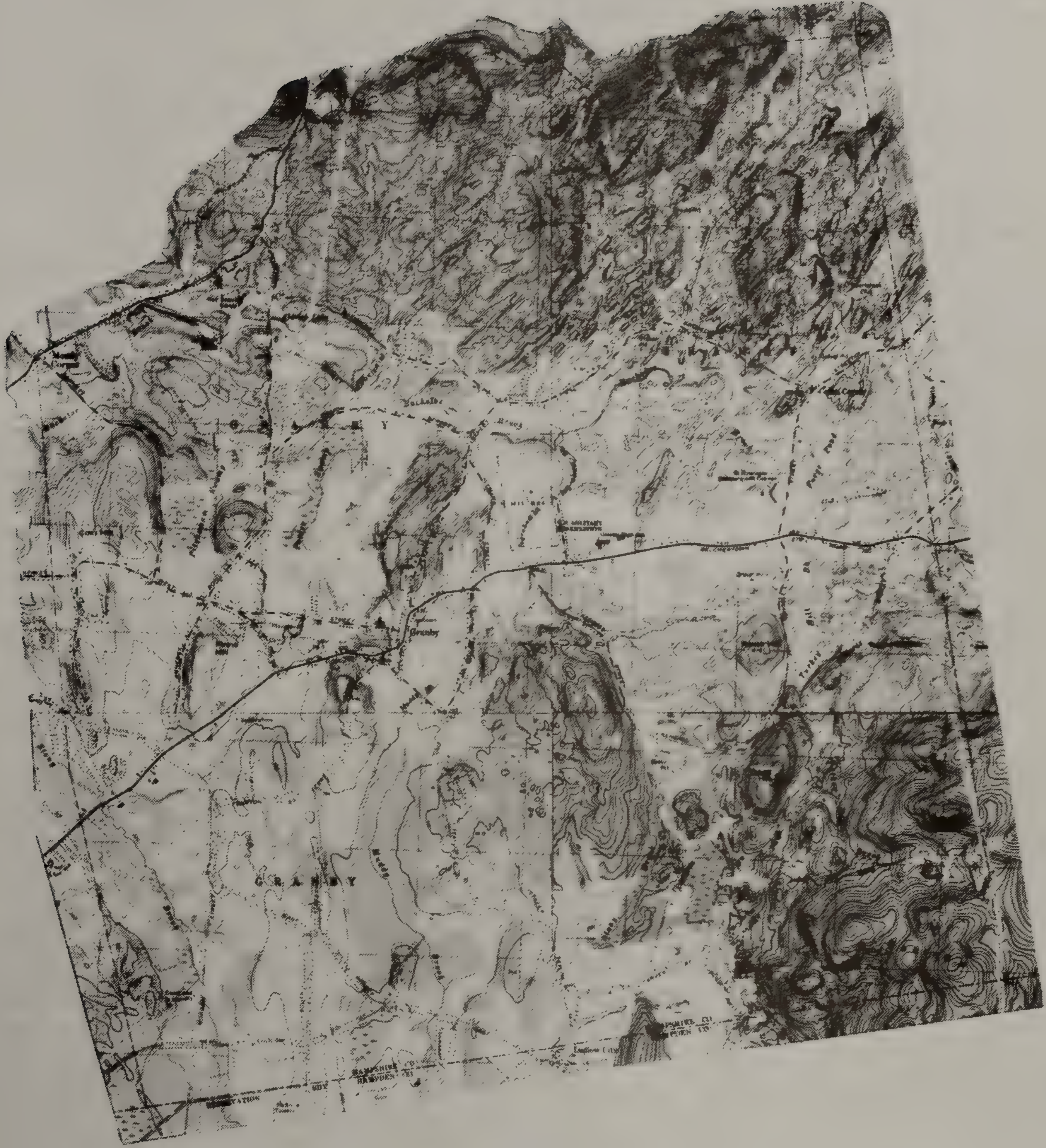
| SYMBOL | DESCRIPTION |
|---|---|
| | OPEN WELL |
| | CLOSED WELL |
| | [illegible] |
| | RESERVOIR |
| | STORAGE TANK |
| | SPRING |

LEGEND-WATER SUPPLY PIPELINES

| PIPE DIA (IN) | SYMBOL | PIPE DIA (IN) | SYMBOL |
|---|---|---|---|
| 4 | | 16 | |
| 6 | | 18 | |
| 8 | | 20 | |
| 10 | | 24 | |
| 12 | | 30 | |
| 14 | | | |

# Connecticut River Valley Pesticide Study

PREPARED BY
[illegible]
[illegible]
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987


G R A N B Y

## 5.9 GREENFIELD

### 5.9.1 Agricultural Land Use

Between 1972 and 1985 the town of Greenfield saw a reduction in the area of its land committed to agricultural production of over 1370 acres or 44 percent. The largest overall changes were in land use types which were reclassified using the improved 1985 photography, such as Pasture, Tilled and Harvested Grasses. Other than reclassified areas, all other areas gained in area. Corn had the largest increases and gained 44 acres (98 percent). Neither Nurseries nor Tobacco were found in 1972 or 1985.

The area committed to agriculture in Greenfield in 1972 represented 22 percent of total town land area. The major portion (63 percent) of the land use types were identified as Tilled. (Table 5-9 lists acreages for each of the land use classifications mapped in this study in Greenfield.) Considering that these photographs were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (Mixed Vegetables) without chlorophyll sensitive film.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and the lack of chlorophyll information. These included Pasture, Harvested Grasses, Tilled and Mixed Vegetables. It is important to note, however, that the difficulties in separating these land use types did not also lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide related land use types, Corn is the most common crop and is grown on about 12 percent of the total area committed to agriculture. Golf Courses accounted for 4 percent of the total. Orchards, Nurseries and Tobacco were not represented at all.

By 1985, land use in the study area had shifted considerably. At that time only 12 percent of the overall land in Greenfield remained committed to agriculture. The total area of farmland was down to 1,774 acres: a drop of 1,370 acres or 44 percent from the 1972 total.

Within Greenfield the Tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of Till is still inflated, however, over the normal mid-summer conditions because of the late September photography. The land use classifications most likely to be affected by this situation includes Corn, Harvested Grasses and Mixed Vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall and land use delineation is, however, far more accurate and precise than that made for 1972. Harvested Grasses and Corn are the major agricultural types and represent about 38 and 29 percent respectively of the land area mapped in Greenfield. Harvested Grasses may, however, include

winter wheat due to the end of season photography date. Pasture and Golf Courses were the next most important agricultural land uses with 17 and 9 percent respectively of the land in Greenfield dedicated to their production. Mixed Vegetables, Tilled and Orchard represented an additional 5, 2 and 1 percent of the mapped area. Nursery and Tobacco were not represented at all.

### 5.9.2 Water Supply & Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20 town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Greenfield, four sites were sampled with no sites having a positive result.** Table 4-1 lists the sample locations with the sample results.

The public water supply overlays were developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of groundwater and surface waters for both community and non-community supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlays also show the distribution systems for the public water supplies.

Approximately 97 percent of the population in Greenfield receives their potable water from a public source which is supplied by the Greenfield Water Department. The Water Department obtains its water from three wells, a reservoir, and a river. The reservoir is located in Leyden. The Water Department also has a well that is no longer in operation and has a site selected for a future well. Five samples (four in Greenfield and one in Leyden) were taken from the Water Department wells, reservoir, and river intake. Samples were tested for seven chemicals with no positive results occurring. The four samples in Greenfield were the only samples taken as part of the DEQE sampling program.

There is a considerable amount of agricultural activity occurring in the reservoir watershed. In 1985, crops grown in the watershed included orchards, harvested grasses, some corn, and pasture land. Though no contamination was found in the sample taken from the reservoir, the potential for future contamination exists.

The three active Water Department wells are also adjacent to an area with agricultural activity. The 1972 and 1985 Agricultural Land Use overlays show that fields in this general area have been used to grow corn. The overlays also show tilled fields and pastures. Consequently, the potential for future contamination exists.

### 5.9.3 Recommendations for Greenfield

Since the majority of residents in Greenfield receive their potable water from the Greenfield Water Department, the threat of consumption of water contaminated by agriculatural chemicals is small since the Water Department should be able to monitor for and detect contamination and implement corrective measures prior to distribution of the water. However, the Greenfield Water Department should continue to monitor their wells and reservoir at least annually for agricultural chemical contamination. From Table 2-3, the list of chemicals recommended by the New England Agricultural Extension Service for the crops grown in the reservoir's watershed and in the area of the wells is extensive. Prior to sampling, surveys of chemical usage on nearby fields should be made to determine which chemicals to sample for.

The sampling program should also be expanded to the isolated areas where agricultural activity exists (as shown on the 1972 and 1985 Agriculture Land Use Overlays) and the only source of potable water is private wells.

TABLE 5-9

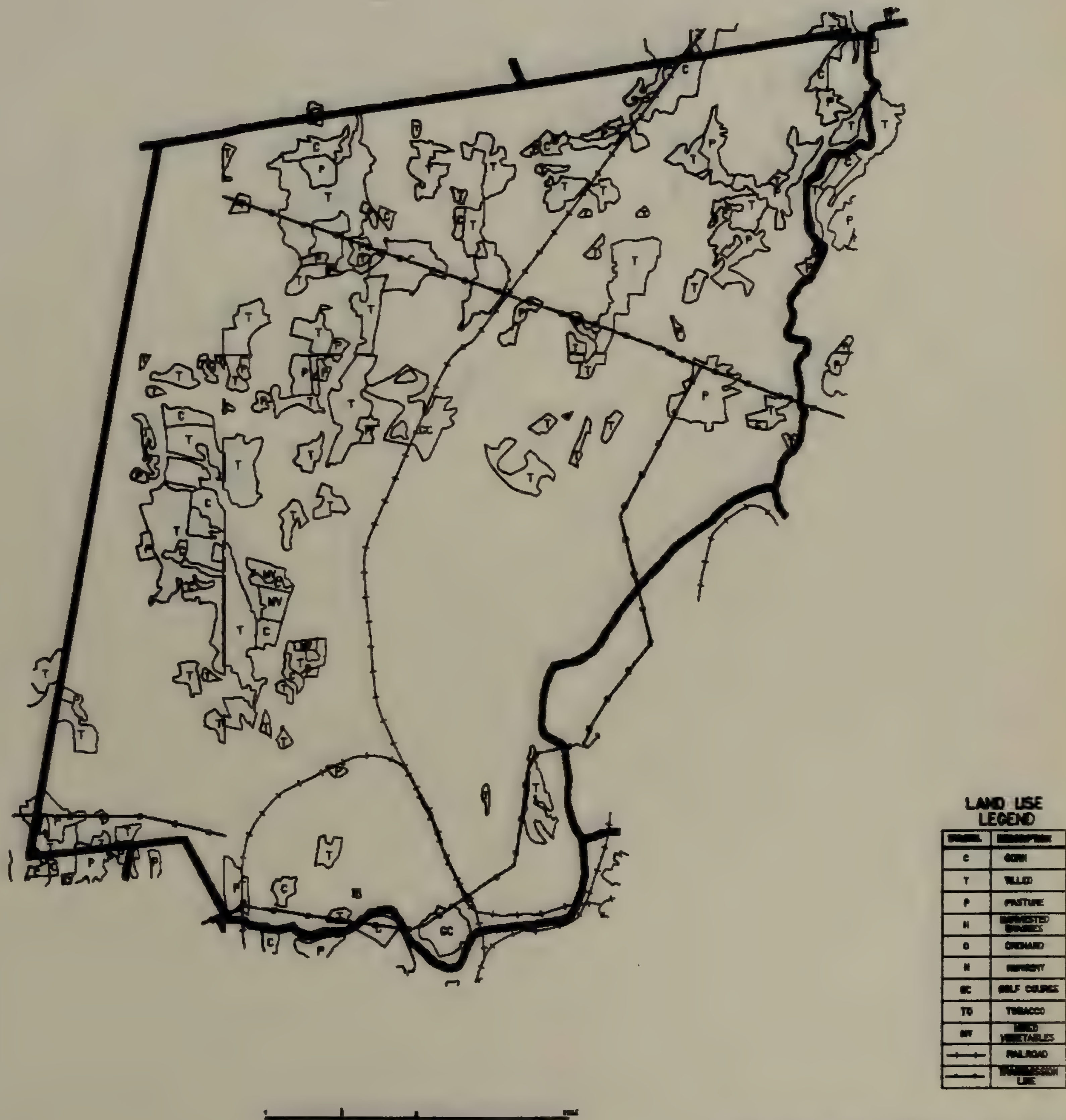
GREENFIELD
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
| Corn | 392 | 12 | 510 | 29 | 118 | 30 |
| Pasture | 583 | 19 | 299 | 17 | -288 | -49 |
| Tilled | 1978 | 63 | 44 | 2 | -1934 | -98 |
| Harvested Grasses | 0 | 0 | 669 | 38 | 669 | - |
| Tobacco | 0 | 0 | 0 | 0 | 0 | - |
| Orchard | 0 | 0 | 10 | 1 | 10 | - |
| Mixed Vegetables | 45 | 1 | 89 | 5 | 44 | 98 |
| Golf Course | 142 | 4 | 153 | 9 | 11 | 8 |
| Nursery | 0 | 0 | 0 | 0 | 0 | - |
| TOTAL | 3144 | 100 | 1774 | 100 | -1370 | -44 |

Area of Town 14,528

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.

AGRICULTURAL
LAND USE




Connecticut River Valley
Pesticide Study

October, 1987

GREENFIELD
MASSACHUSETTS

# 1986 AGRICULTURAL LAND USE

LAND USE LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| C | CORN |
| T | TILLED |
| P | PASTURE |
| H | HARVESTED GRASSES |
| O | ORCHARD |
| N | NURSERY |
| GC | GOLF COURSE |
| TO | TOBACCO |
| MV | MIXED VEGETABLES |
| —•—•— | RAILROAD |
| ——— | TRANSMISSION LINE |

## Connecticut River Valley Pesticide Study

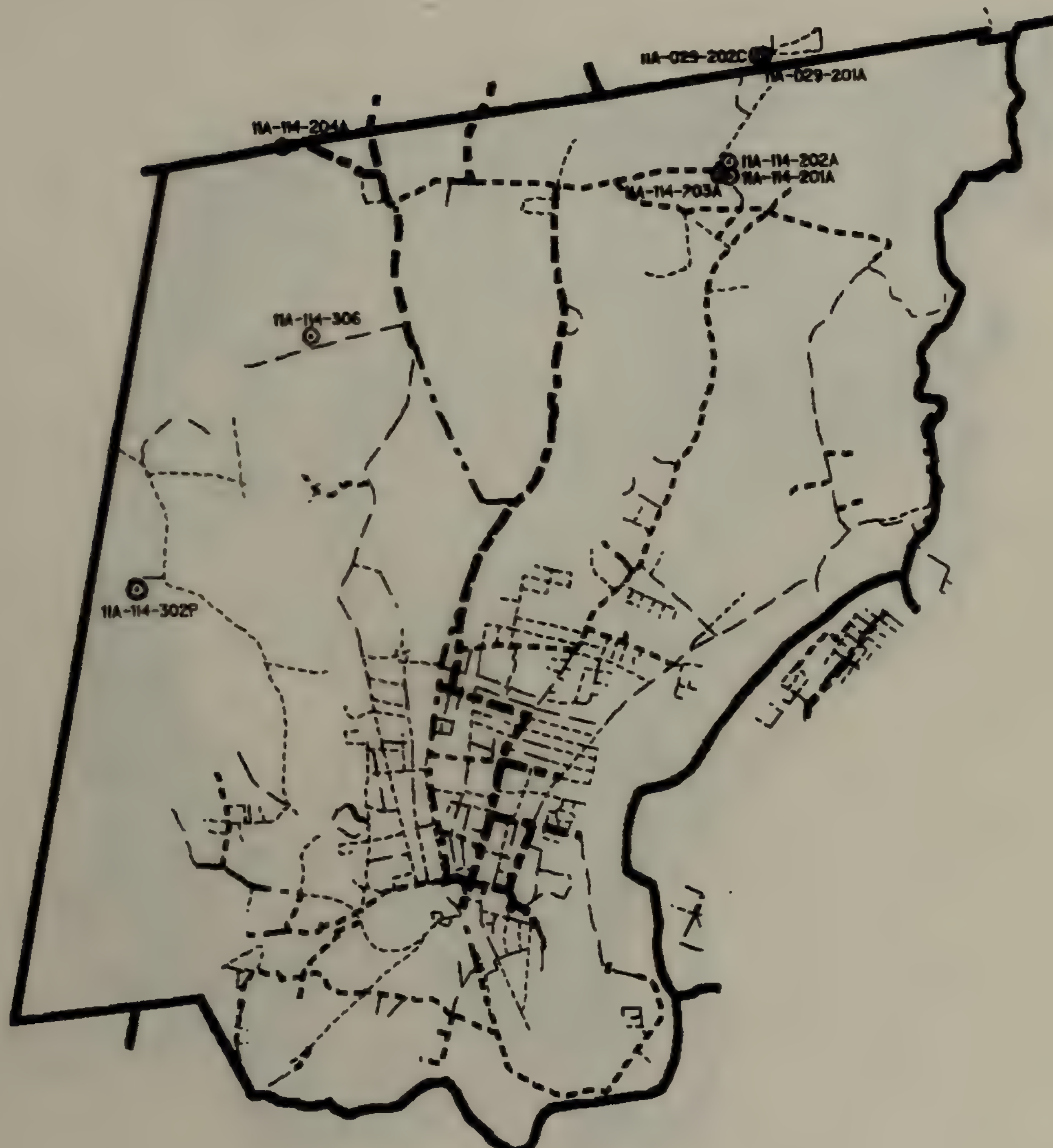
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

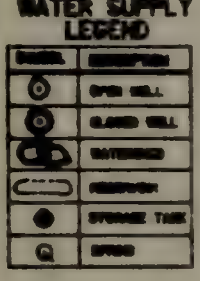
LEGEND-AGRICULTURAL CHEMICALS

| AGRICULTURAL CHEMICALS | SYMBOL | | AGRICULTURAL CHEMICALS | SYMBOL | |
|---|---|---|---|---|---|
| | PRESENT | OVER | | PRESENT | OVER |
| ETHYLENE DIBROMIDE | □ | ■ | OXAMYL | ✕ | ✖ |
| ALDICARB | △ | ▲ | DINOSEB | ☽ | ☾ |
| ALACHLOR | ▽ | ▼ | | | |
| CARBOFURAN | ◇ | ◆ | | | |
| 1,2-DICHLOROPROPANE | + | ✚ | | | |

# Connecticut River Valley Pesticide Study

PREPARED BY
[illegible]
[illegible], MASSACHUSETTS
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987



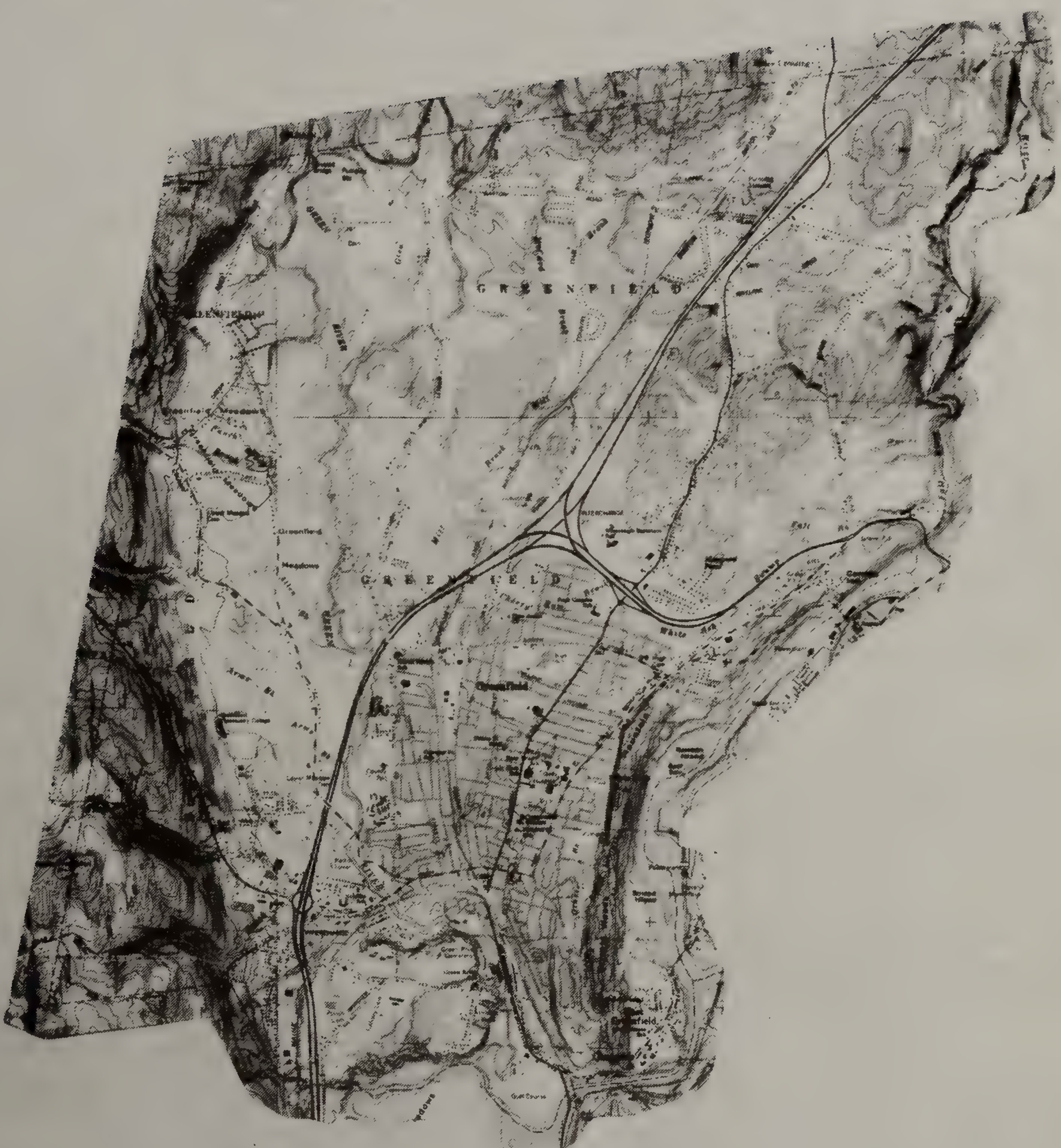




LEGEND-WATER SUPPLY PIPELINES

| | | | |
|---|---|---|---|
| 4 | | 16 | |
| 6 | | 18 | |
| 8 | | 20 | |
| 10 | | 24 | |
| 12 | | 30 | |
| 14 | | | |

# Connecticut River Valley Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987



## 5.10 HADLEY

### 5.10.1 Agricultural Land Use

Between 1972 and 1985 the town of Hadley saw a 3,000 acre or 34 percent reduction in the area of its land committed to agricultural production. The largest overall changes were in land use types which were reclassified using the improved 1985 photography, such as Pasture, Tilled and Harvested Grasses. Other than reclassified areas, Corn had the largest decreases, having lost 387 acres (43 percent) of its 1972 area. Mixed Vegetables lost 83 acres (84 percent). Tobacco was not found in either 1972 or 1985. The greatest increase was in the acreage of Orchard, which had a 104 acre increase (495 percent) from 21 to 125 acres under production, while Nurseries went from 0 to 85 acres. Table 5-10 lists acreages for each of the land use classifications mapped in this study in Hadley.

The area committed to agriculture in Hadley in 1972 represented 59 percent of total town land area. The major portion (44 percent) of the land use types were identified as Tilled. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (Mixed Vegetables) without chlorophyll sensitive film.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and the lack of chlorophyll information. These included Pasture, Harvested Grasses, Tilled and Mixed Vegetables. It is important to note, however, that the difficulties in separating these land use types did not also lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide related land use types, Corn was the most common crop and was grown on about 27 percent of the total area committed to agriculture, and Mixed Vegetables accounted for 14 percent (1325 acres). Tobacco, Orchards, Golf Course and Nurseries accounted for 2, 1, 1 and <1 percent of the total.

By 1985, land use in the study area had shifted considerably. At that time only 39 percent of the overall land in Hadley remained committed to agriculture. The total area of farmland was down to 6,128 acres: a drop of 3115 acres or 34 percent from the 1972 total.

Within Hadley, the Tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetables had been removed. The acreage of Till is sill inflated, however, over the normal mid-summer conditions because of the late September photography. The land use classifications most likely to be affected by this situation includes Corn, Harvested Grasses and Mixed Vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall land use delineation is, however, far more accurate and precise than that made for 1972. Corn and Harvested Grasses are the major

agricultural type and represent about 27 percent each, of the land area mapped in Hadley. Harvested Grasses may, however, include winter wheat due to the end of season photography date. Mixed Vegetables was the next most important agricultural land use, accounting for 17 percent (1034 acres). Tilled and Pasture accounted for 17 and 10 percent, respectively, of the land in Hadley dedicated to agricultural production. Tobacco and Orchard accounted for the remaining 2 percent of the mapped area.

5.10.1 Water Supply and Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20 town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Hadley, seven sites were sampled with no site having a positive result.** Table 4-1 lists the sample locations with the sample results.

The public water supply overlays were developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of groundwater and surface waters for both community and non-community supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlays also show the distribution systems for the public water supplies.

Over 90 percent of the population in Hadley receives their potable water from a public source. Hadley has two sources of public water. The majority of public water is supplied by the Hadley Water Department, which presently obtains its water from four wells. The Water Department also has three reservoirs which are not presently connected to the water distribution system. Hadley also has a source of non-community public water, Mitch's Marina, which supplies its facility only.

As part of the DEQE sampling program, seven sites (three were Water Department wells) in Hadley have been sampled for one or more of the seven agricultural chemicals with none of the sample sites having a positive result. Five sites were sampled for Ethylene Dibromide and 1,2-Dichloropropane, four sites were sampled for Aldicarb and two sites were sampled for Carbofuran, Oxymal, Alachlor, and Dinoseb.

5.10.3 Recommendations for Hadley

The majority of potable water in Hadley is taken from ground water sources. Although no contamination has yet been found in any of the public wells, the potential for contamination exists since the wells are located adjacent to active agriculture activity. The 1972 and 1985 Agriculutural Land Use overlays show that fields near the public wells have been used to grow corn and mixed vegetables. The overlays also show tilled fields and pastures.

The vast majority of residents in Hadley receive their potable water from the Hadley Water Department. Consequently, the threat of consumption of agricultural chemical contaminated water is small since the Water Department should be able to monitor for and detect contamination and implement corrective measures prior to distribution.

Since a large portion of Hadley is agricultural, private wells in Hadley could be contaminated, especially if they are shallow aquifer wells. Consequently, the Hadley Water Department should continue to monitor their wells at least annually for agricultural chemical contamination. As shown in Table 2-3, the list of chemicals recommended by the New England Agricultural Extension Service for the crops grown in the vicinity of the public wells is extensive. Prior to sampling surveys of chemical usage on the nearby fields should be made to determine which chemicals to sample for.

TABLE 5-10

HADLEY
LAND USE
1972 AND 1985

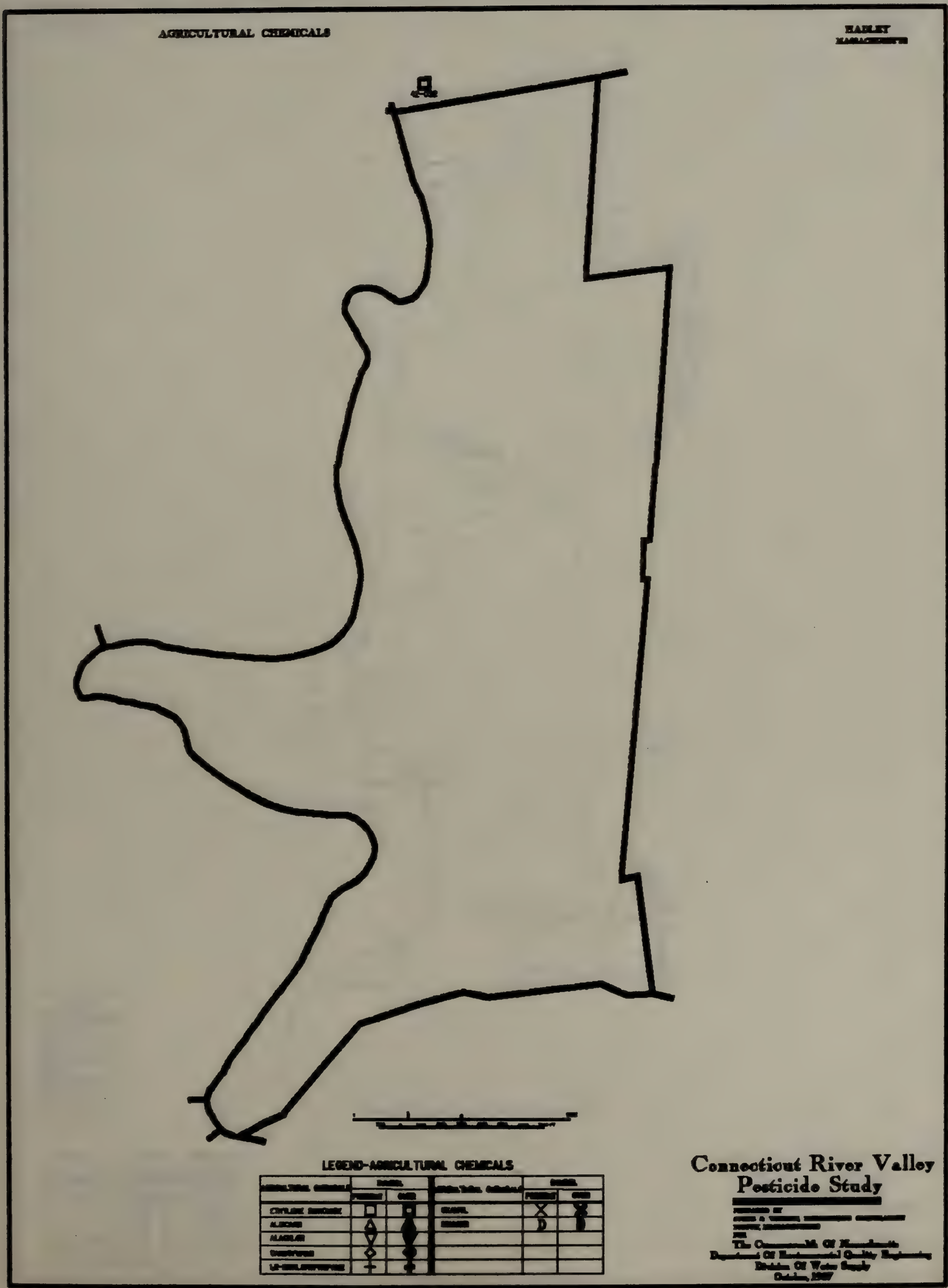
| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
| Corn | 2502 | 27 | 1678 | 27 | -824 | -33 |
| Pasture | 932 | 10 | 583 | 10 | -349 | -37 |
| Tilled | 4069 | 44 | 1031 | 17 | -3038 | -75 |
| Harvested Grasses | 0 | 0 | 1673 | 27 | 1673 | - |
| Tobacco | 209 | 2 | 66 | 1 | -143 | -68 |
| Orchard | 79 | 1 | 63 | 1 | -16 | -20 |
| Mixed Vegetables | 1325 | 14 | 1034 | 17 | -291 | -22 |
| Golf Course | 90 | 1 | 0 | 0 | -90 | -100 |
| Nursery | 37 | 0 | 0 | 0 | -37 | -100 |
| TOTAL | 9243 | 100 | 6128 | 100 | -3115 | -34 |

Area of Town 15,744

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.


AGRICULTURAL
LAND USE
LAND USE
LEGEND
Connecticut River Valley
Pesticide Study


AGRICULTURAL
LAND USE
LAND USE
LEGEND
Connecticut River Valley
Pesticide Study


AGRICULTURAL CHEMICALS
HADLEY
LEGEND-AGRICULTURAL CHEMICALS
Connecticut River Valley
Pesticide Study


WATER SUPPLY
HADLEY
11A-117-301A
11A-117-300A
WS
WATER SUPPLY LEGEND
LEGEND-WATER SUPPLY PIPELINES
Connecticut River Valley
Pesticide Study


HADLEY
RIVER
North Hadley
RIVER
CONNECTICUT
RIVER
HADLEY
Hadley
H A D L E Y
CONNECTICUT
RIVER
SKINNER STATE PARK
H O L Y O K E
R A N G E

## 5.11 HATFIELD

### 5.11.1 Agricultural Land Use

Between 1972 and 1985 the town of Hatfield saw a reduction in the area of its land committed to agricultural production of over 2,900 acres or 61 percent. The largest overall changes were in land use types which were reclassified using the improved 1985 photography, such as Pasture, Tilled and Harvested Grasses. Other than reclassified areas, Corn had the largest decreases, having lost 739 acres (46 percent) of its 1972 area. Tobacco did not lose as many acres, but went from 437 in 1972 to 0 in 1985. Mixed Vegetables also lost considerably and went from 372 to 28 acres. (Table 5-11 lists acreages for each of the land use classifications mapped in this study in Hatfield).

In 1972 the area committed to agriculture in Hatfield represented 15 percent of total town land area. The major portion (48 percent) of the land use types were identified as Tilled. Considering that the photographs used in this study were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (Mixed Vegetables) without chlorophyll sensitive film.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and the lack of chlorophyll information. These included Pasture, Harvested Grasses, Tilled and Mixed Vegetables. It is important to note, however, that the difficulties in separating these land use types did not also lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide related land use types, Corn was the most common crop and was grown on about 34 percent of the total area committed to agriculture. Tobacco accounted for 9 percent of the total, and Pasture and Orchards occupied about 2 percent of the agricultural land use areas.

By 1985, agricultural land use in the study area had shifted considerably. At that time only 18 percent of the overall land in Hatfield remained committed to agriculture. The total area of farmland was down to 1,838 acres: a drop of 2903 acres or 61 percent from the 1972 total.

Within Hatfield, the Tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of Till is still inflated, however, over the normal mid-summer conditions because of the late September photography. The land use classifications most likely to be affected by this situation include Corn, Harvested Grasses and Mixed Vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall and land use delineation is, however, far more accurate and precise than that made for 1972. Corn was the major agricultural type and represented about 46 percent of the land area mapped in Hatfield. Tilled

and Pasture were the next largest components and accounted for 26 and 21 percent, respectively, of the area mapped. Harvested Grasses and Mixed Vegetables were the next most important agricultural land uses and accounted for a combined total of about 7 percent of the land in Hatfield. Harvested Grasses may, however, include winter wheat due to the end of season photography date. Tobacco, Orchards, Golf Courses and nurseries were not represented at all.

5.11.2 Water Supply & Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20-town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Hatfield, 13 sites were sampled with five having positive results.** Table 4-1 lists the sample locations with the sample results.

The positive results were shown on the agricultural chemical overlay as either a light character or a dark character depending on whether or not the concentration measured was over the Massachusetts Interim Drinking Water Guidelines (IDWG). The dark characters represent locations where the concentrations found were over the guidelines. The light characters represent locations where the concentrations were less than or equal to the IDWG **or where the concentrations were at one time over the IDWG but on subsequent sampling were found to be less than the IDWG or not detected at all.** Table 2-4 lists the IDWG for the seven agricultural chemicals. The locations with positive results are labeled with a map number and the well depth, if applicable or available. The map numbers for the locations with positive results are shown on Table 4-2.

The public water supply overlays were developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of groundwater and surface waters for both community and non-community supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlays also show the distribution systems for the public water supplies.

Approximately 80 percent of the population in Hatfield receives their potable water from the Hatfield Water Department, which obtains its water from two wells and one reservoir. Both wells and the reservoir were sampled for all seven chemicals. The only positive result was for 1,2-Dichloropropane in the reservoir that was less than the IDWG limit. The majority (greater than 90 percent in 1985) of water supplied by the Water Department is pumped from the two wells.

The DEQE sampling program has sampled 13 sites in Hatfield for one or more of the seven agricultural chemicals. Out of the 13 sample locations, 12 were tested for 1,2-Dichloropropane and 12 were tested for Ethylene Dibromide. Four locations were sampled for Aldicarb and three sample

locations were sampled for Carbofuran, Alachlor, Oxymal, and Dinoseb. Five sample sites had positive results for Ethylene Dibromide or 1,2-Dichloropropane. These positive results include one location where Ethylene Dibromide was found one year but not in a later year. All five positive sample sites had 1,2-Dichloropropane contamination. One of the positive results for 1,2-Dichloropropane was over the IDWG limits. Contamination for 1,2-Dichloropropane was generally located in the Mountain Road-Pantry Road area of Hatfield. Sample locations where contamination was found are shown on the agricultural chemical overlay.

Examination of the 1972 and 1985 Agricultural Land Use overlays in the area where agricultural chemical contamination exists indicates that the contamination may be from the nearby fields. The land use overlays show that in 1985 this area was used to grow corn, harvested grasses, and a small amount of mixed vegetables. In 1972, this land was used to grow tobacco and a small amount of mixed vegetables. There was also some tilled land. Table 3 lists the chemicals that were recommended by the New England Agricultural Extension Service for each crop type. 1,2-Dichloropropane was recommended for mixed vegetables, beans, and potatoes in 1972 and for mixed vegetables, fruit trees, and nursery crops in 1985. 1,2-Dichloropropane has also been used on tobacco crops. Ethylene Dibromide was recommended for tobacco in 1972 and was not recommended for any crops in 1985.

A review of the public water distribution systems indicates that public water is available near the Mountain Road-Pantry Road area where contamination was found, though differences in elevation may make supply to part of this area difficult.

### 5.11.3 Recommendations for Hatfield

For those residents in Hatfield who receive their potable water from the Hatfield Water Department, the threat of consumption of agricultural chemical contaminated water in excess of the IDWG limits is small since the Water Department should be able to monitor for and detect contamination and implement corrective measures prior to distribution.

The majority of population in Hatfield gets their water from ground water sources. One of the Water Department wells is near the area of contamination though the well's depth probably precludes any immediate contamination. The Agricultural Land Use overlays show a small amount of agricultural activity, consisting of pastures and tilled fields, within the Water Department's reservoir's water shed.

The Water Department should continue to monitor their water supplies at least annually for agricultural chemical contamination and should consider implementing a study to determine the source of contamination in their reservoir. The sampling program should also be expanded into the areas of town where agricultural activity is occurring (as shown on the 1972 and 1985 overlays) and the only source of potable water is from private wells.

From Table 2-3 the list of recommended chemicals for the crops generally grown in Hatfield is extensive. Prior to sampling for any of these chemicals, surveys of chemical usage on fields near ground water sources to be sampled should be made to determine which chemicals to sample for.

TABLE 5-11

HATFIELD
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
| Corn | 1588 | 34 | 849 | 46 | -739 | -46 |
| Pasture | 76 | 2 | 387 | 21 | 311 | 409 |
| Tilled | 2266 | 48 | 480 | 26 | -1786 | -79 |
| Harvested Grasses | 0 | 0 | 94 | 5 | 94 | - |
| Tobacco | 437 | 9 | 0 | 0 | -437 | -100 |
| Orchard | 2 | <1 | 0 | 0 | -2 | -100 |
| Mixed Vegetables | 372 | 8 | 28 | 2 | -344 | -92 |
| Golf Course | 0 | 0 | 0 | 0 | 0 | - |
| Nursery | 0 | 0 | 0 | 0 | 0 | - |
| TOTAL | 4741 | 100 | 1838 | 100 | 2903 | 61 |

Area of Town 10,112

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.

1972 AGRICULTURAL
LAND USE

HATFIELD
MASSACHUSETTS


# Connecticut River Valley Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

1985 AGRICULTURAL
LAND USE

HATFIELD
MASSACHUSETTS

LAND USE
LEGEND

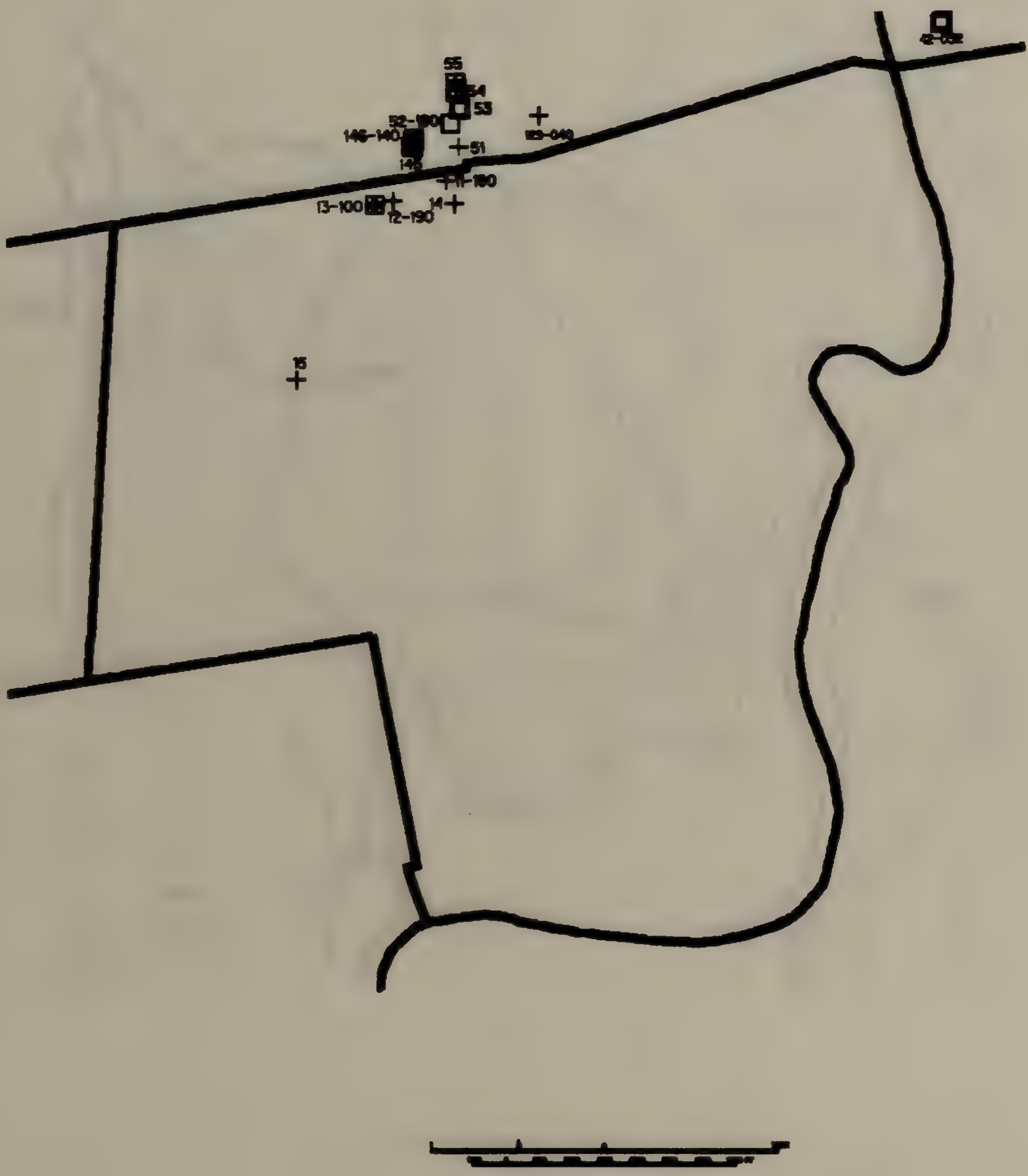
| [illegible] | [illegible] |
|---|---|
| C | [illegible] |
| T | TILLED |
| P | [illegible] |
| H | [illegible] |
| O | [illegible] |
| N | [illegible] |
| GC | [illegible] |
| TO | [illegible] |
| MV | [illegible] |
|  | [illegible] |
|  | [illegible] |

# Connecticut River Valley Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

AGRICULTURAL CHEMICALS

HATFIELD
[illegible]




LEGEND-AGRICULTURAL CHEMICALS

| AGRICULTURAL CHEMICALS | SYMBOL | | AGRICULTURAL CHEMICALS | SYMBOL | |
|---|---|---|---|---|---|
| | PRESENT | OVER | | PRESENT | OVER |
| ETHYLENE DIBROMIDE | □ | ■ | [illegible] | × | ✖ |
| ALDICARB | △ | ▲ | [illegible] | D | [illegible] |
| ALACHLOR | ▽ | ▼ | | | |
| CARBOFURAN | ◇ | ◆ | | | |
| 1,2-DICHLOROPROPANE | + | ✚ | | | |

# Connecticut River Valley Pesticide Study

[illegible]
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
[illegible]


WATER SUPPLY LEGEND

| | |
|---|---|
| | OPEN WELL |
| | CLOSED WELL |
| | [illegible] |
| | [illegible] |
| | [illegible] |
| | [illegible] |

LEGEND-WATER SUPPLY PIPELINES

| [illegible] | [illegible] | [illegible] | [illegible] |
|---|---|---|---|
| 4 | | [illegible] | |
| 6 | | [illegible] | |
| 8 | | [illegible] | |
| [illegible] | | [illegible] | |
| [illegible] | | [illegible] | |
| [illegible] | | | |

# Connecticut River Valley Pesticide Study

[illegible]


North Hatfield
HATFIELD
Hatfield
HATFIELD
CONNECTICUT
RIVER
RIVER
RIVER

## 5.12 MONTAGUE

### 5.12.1 Agricultural Land Use

Between 1972 and 1985 the town of Montague saw a reduction in the area of its land committed to agricultural production of over 640 acres or 26 percent. The largest overall changes were in land use types which were reclassified using the improved 1985 photography, such as Pasture, Tilled and Harvested Grasses. Other than reclassified areas, Corn had the largest decreases, having lost 739 acres (46 percent) of its 1972 area. Tobacco is the other notable decrease as it went from 110 in 1972 to 0 in 1985.

The area committed to agriculture in Montague in 1972 represented 13 percent of total town land area. The major portion (45 percent) of these land use types were identified as Tilled. (Table 5-12 lists acreages for each of the land use classifications mapped in this study in Montague). Considering that these photographs were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (Mixed Vegetables) without chlorophyll sensitive film.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and the lack of chlorophyll information. These included Pasture, Harvested Grasses, Tilled and Mixed Vegetables. The difficulties in separating these land use types did not lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide related land use types, Corn was the most common crop and was grown on about 26 percent of the total area committed to agriculture. Tobacco and Mixed Vegetables were next in importance and accounted for about 4 percent each of the total. Golf Courses, Nurseries and Orchards occupied a total of about 2 percent of the agricultural land use areas.

By 1985, agricultural land use in the study area had shifted considerably. At that time only 18 percent of the overall land in Montague remained committed to agriculture. The total area of farmland was down to 1,807 acres: a drop of 641 acres or 26 percent from the 1972 total.

Within Montague the Tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of Till is still inflated, however, over the normal mid-summer conditions because of the late September photography. The land use classifications most likely to be affected by this situation include Corn, Harvested Grasses and Mixed Vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year. The overall and land use delineation is, however, far more accurate and precise than that made for 1972. Harvested Grasses is the major agricultural type and represents about 49 percent of the land area mapped in Montague. Harvested Grasses may, however, include

winter wheat due to the end of season photography date. Pasture, Corn and Tilled were the next largest component of the agricultural land use types in Montague and were found in 17, 13 and 13 percent of the area mapped. Mixed Vegetables were the smallest area with 7 percent of the area. Tobacco, Orchards, Golf Courses and Nurseries had dropped from the findings altogether.

5.12.2 Water Supply and Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20-town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Montague, nine sites were sampled with three sites having positive results.** Table 4-1 lists the sample locations with the sample results.

The positive results were shown on the agricultural chemical overlays as either a light character or a dark character depending on whether or not the concentration measured was over the Massachusetts Interim Drinking Water Guidelines (IDWG). The dark characters represent locations where the concentrations found were over the guidelines. The light characters represent locations where the concentrations were less than or equal to the IDWG **or where the concentrations were at one time over the IDWG but on subsequent sampling were found to be less than the IDWG or not detected at all.** Table 2-4 lists the IDWG for the seven agricultural chemicals. The locations with positive results are labeled with a map number and the will depth, if applicable or available. The map numbers for the locations with positive results are shown on Table 4-2.

The public water supply overlays were developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of groundwater and surface waters for both community and non-community supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlays also show the distribution systems for the public water supplies.

Over 90 percent of the population in Montague receive their potable water from one of four sources of public water. These sources of public water are the Lake Pleasant Water District, Millers Falls F&W District, Montague Center Water District, and the Turners Falls Fire District. The Lake Pleasant Water District obtains its water from two reservoirs. The Millers Falls F&W District obtains its water from one well. The Montague Center Water District obtains its water from one spring. The Turners Falls Fire District obtains its water from two wells. One of the Turners Falls Fire District wells was tested for Ethylene Dibromide and 1,2-Dichloropropane with a positive result for 1,2-Dichloropropane that was below the IDWG limit. Turners Falls Fire District water was tested for all seven chemicals with no positive results occurring.

As part of the DEQE sampling program, nine sites (two public) in Montague have been sampled for one or more of the seven agricultural chemicals. Out of the nine sample locations, six were sampled for Ethylene Dibromide, six were sampled for 1,2-Dichloropropane, seven were sampled for Aldicarb, and four were sampled for Carbofuran, Oxamyl, Alachlor, and Dinoseb. Three sample sites had positive results for one chemical. There were two positive results for 1,2-Dichloropropane and one positive result for Aldicarb. The positive result for Aldicarb occurred in one year but not in a later year. None of the positive results were above the IDWG limits. The majority of sampling occurred in the southwest corner of Montague. (Sample locations with positive results are shown on the agricultural chemical overlay.)

Examination of the 1972 and 1985 Agricultural Land Use overlays for the areas where agricultural chemical contamination exists indicates that the contamination may be from nearby fields. The Land Use overlays show that one of the areas where 1,2-Dichloropropane contamination was found was used to grow mixed vegetables, corn, and harvested grasses in 1985 and corn and tobacco in 1972. The other area with 1,2-Dichloropropane contamination was used for harvested grasses and pasture in 1985 and pasture and tilled fields in 1972. The area with Aldicarb contamination was used to grow corn and harvested grasses, with tilled fields in 1985 and corn and pastures in 1972. Table 3 lists the chemicals that are recommended for each crop type. Aldicarb was recommended for potatoes in 1985. 1,2-Dichloropropane was recommended for mixed vegetables, berries, and potatoes in 1972; and mixed vegetables, tree fruit, and nursery crops in 1985. 1,2-Dichloropropane has also been used on tobacco.

A review of the public water distribution systems indicates that the contaminated private wells are over a mile away from the nearest public water supply.

The Land Use overlays indicate that several public wells in Montague are near active farming and should be sampled for contamination. This includes both of the Turners Falls Fire District wells and the Center Water District Spring.

### 5.12.3 Recommendations for Montague

Since the majority of residents in Montague receive their potable water from public water supplies, the threat of consumption of water contaminated by agricultural chemicals in excess of the IDWG limits is small. The various water supplies should be able to monitor for and detect contamination and implement corrective measures prior to distribution of the water.

The Turners Falls Fire District should continue to monitor their groundwater supplies for agricultural chemical contamination since contamination has been found and the supplies are near active farming. The Turners Falls Fire District should also consider implementing a study as described in the beginning of Section 5 to determine the source of contamination in their well. This study could include:

- Determination of groundwater flows through the use of peizometers in the aquifer

- Surveying past and present chemical usage by farmers on upgradient fields

- Water quality analysis of groundwater from the upgradient peizometers

- Analysis of soil samples from the peizometers to determine contamination versus depth

- Computer modelling of pesticide migration to estimate the extent of past contamination and predict future contamination

The sampling program should be expanded on the southwest side of Montague since there is no public water supply available and there is a large amount of agricultural activity present. The 1972 and 1985 Agricultural Land Use overlays show that fields in this general area have been used to grow corn and harvested grasses. The overlays also show tilled fields and pastures. From Table 2-3 the list of chemicals recommended by the New England Agricultural Extension Service for these crops is extensive. Prior to sampling for these chemicals, surveys of chemical usage on nearby fields should be made to determine which chemicals to sample for.

TABLE 5-12

MONTAGUE
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
| Corn | 638 | 26 | 240 | 13 | -398 | -62 |
| Pasture | 434 | 18 | 312 | 17 | -122 | -28 |
| Tilled | 1110 | 45 | 238 | 13 | -872 | -79 |
| Harvested Grasses | 0 | 0 | 888 | 49 | 888 | - |
| Tobacco | 110 | 4 | 0 | 0 | -110 | -100 |
| Orchard | 7 | <1 | 0 | 0 | -7 | -100 |
| Mixed Vegetables | 105 | 4 | 129 | 7 | 24 | 23 |
| Golf Course | 36 | 2 | 0 | 0 | -36 | -100 |
| Nursery | 8 | <1 | 0 | 0 | -8 | -100 |
| TOTAL | 2448 | 100 | 1807 | 100 | -641 | -26 |

Area of Town 18,880

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.

1972 AGRICULTURAL
LAND USE
LAND USE
LEGEND
Connecticut River Valley
Pesticide Study

1986 AGRICULTURAL
LAND USE

MONTAGUE
MASSACHUSETTS


Connecticut River Valley
Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

AGRICULTURAL CHEMICALS

MONTAGUE
[illegible]


LEGEND-AGRICULTURAL CHEMICALS

| [illegible] | [illegible] | | [illegible] | [illegible] | |
|---|---|---|---|---|---|
| | [illegible] | [illegible] | | [illegible] | [illegible] |
| ETHYLENE [illegible] | | | [illegible] | | |
| [illegible] | | | [illegible] | | |
| [illegible] | | | | | |
| [illegible] | | | | | |
| [illegible] | | | | | |

# Connecticut River Valley Pesticide Study

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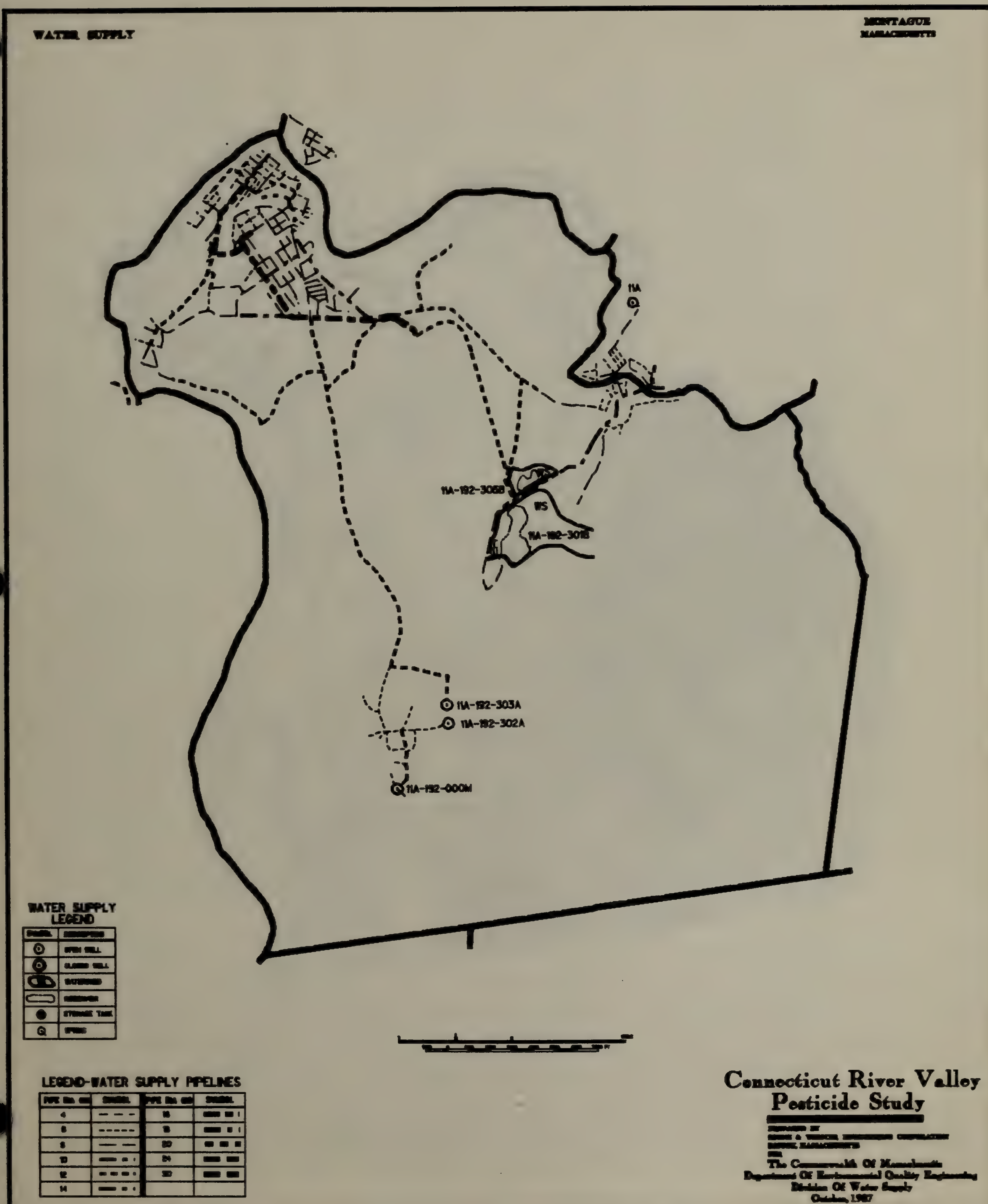
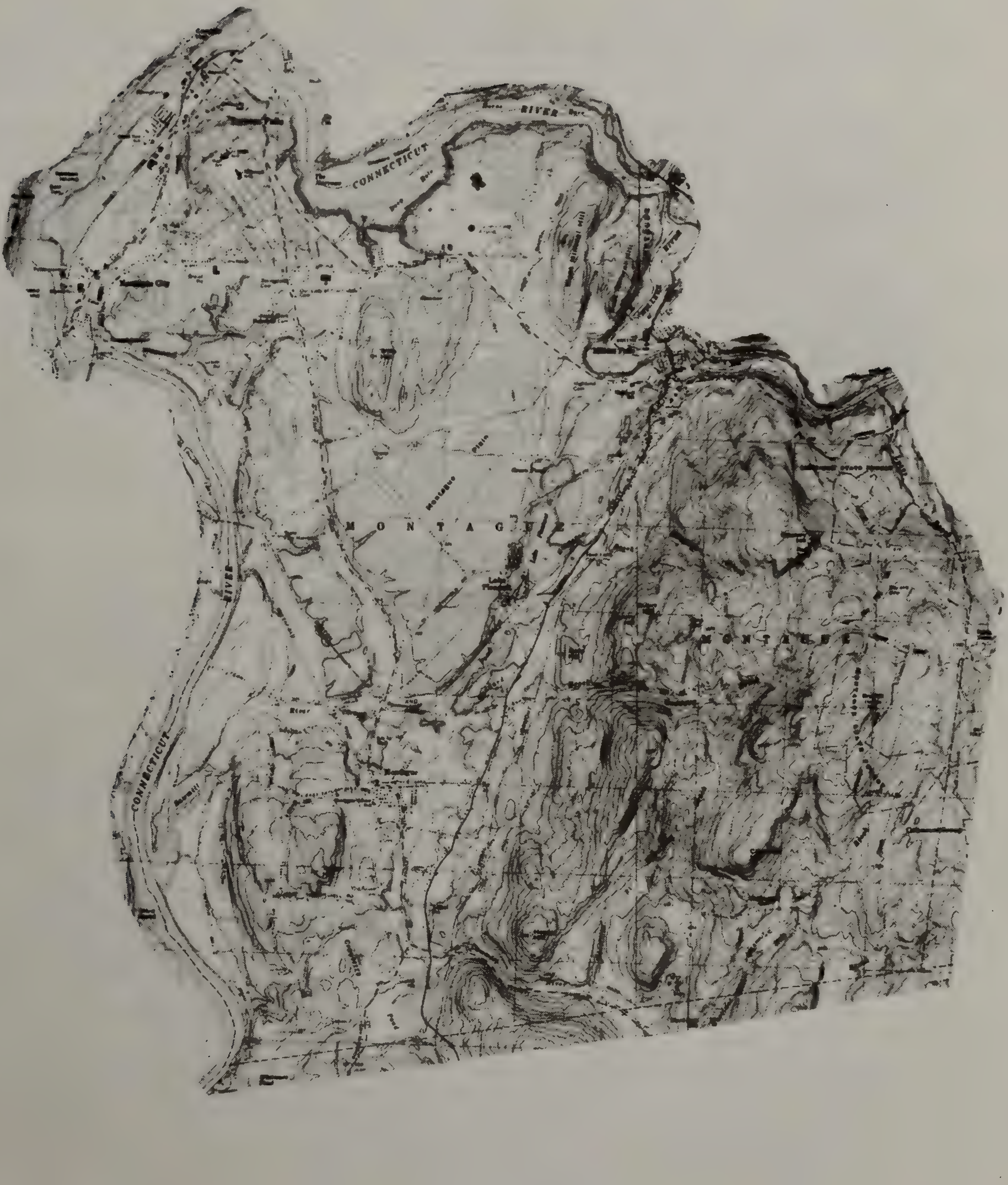
The [illegible] Of [illegible]
Department Of [illegible] Quality Engineering
[illegible] Of Water [illegible]
[illegible], 1987


WATER SUPPLY
MONTAGUE
MASSACHUSETTS
11A
11A-192-306B
WS
11A-192-301B
11A-192-303A
11A-192-302A
11A-192-000M
WATER SUPPLY LEGEND
LEGEND-WATER SUPPLY PIPELINES
Connecticut River Valley
Pesticide Study
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987



CONNECTICUT
RIVER
M O N T A G U E
RIVER
CONNECTICUT

## 5.13 NORTHAMPTON

### 5.13.1 Agricultural Land Use

Between 1972 and 1985 the town of Northampton saw a reduction in the area of its land committed to agricultural production of over 2,400 acres or 50 percent.

The largest overall changes were in land use types which were reclassified using the improved 1985 photography, such as Pasture, Tilled and Harvested Grasses. Other than reclassified areas, corn had the largest decreases, having lost 900 acres (56 percent) of its 1972 area. Mixed vegetables also lost considerably and went from 913 to 117 acres.

The area committed to agriculture in Northampton in 1972 represented 22 percent of total land area. The major portion (48 percent) of these land use types were identified as Tilled. (Table 5-13 lists acreages for each of the land use classifications mapped in this study in Northampton). Considering that these photographs were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (Mixed Vegetables) without chlorophyll sensitive film.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and lack of chlorophyll information. These included pasture, harvested grasses, tilled and mixed vegetables. The difficulties in separating these land use types did not lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide related land use types, corn was the most common crop and was grown on about 34 percent of the total area committed to agriculture. Golf courses, tobacco and orchards accounted for a combined total of about 6 percent of the total. Nurseries were not found in either year.

By 1985, agricultural land use in the study area had shifted considerably. At that time only 11 percent of the overall land in Northampton remained committed to agriculture. The total area of farmland was down to 2,380 acres: a drop of 2430 acres or 50 percent from the 1972 total.

Within Northampton the tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of till is still inflated, however, over the normal mid-summer conditions because of the late September photography. The land use classifications most likely to be affected by this situation include corn, harvested grasses and mixed vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall and land use delineation is, however, far more accurate and precise than that made for 1972. Corn and Tilled were the major

agricultural types and represent about 30 and 29 percent, respectively, of the land area mapped in Northampton. Harvested grasses and pasture were the next most common land use type mapped accounting for 18 and 12 percent, respectively, of the area. Harvested grasses may, however, include winter wheat due to the end of season photography date. Mixed vegetables, golf courses and orchards were the next most important agricultural land uses and accounted for a combined total of about 11 percent of the land in Northampton. Tobacco and nurseries were not represented at all.

5.13.2 Water Supply & Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20 town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Northampton, five sites were sampled with one site having a positive result.** Table 4-1 lists the sample locations with the sample results.

Positive results were shown on the Agricultural Chemical overlay as either a light character or a dark character depending on whether or not the concentration measured was over the Massachusetts Interim Drinking Water Guidelines (IDWG). The dark characters represent locations where the concentrations found were over the guidelines. The light characters represent locations where the concentrations were less than or equal to the IDWG **or where the concentrations were at one time over the IDWG but on subsequent sampling were found to be less than the IDWG or not detected at all.** Table 2-4 lists the IDWG for the seven agricultural chemicals. The locations with positive results are labeled with a map number and the well depth, if applicable or available. The map numbers for the locations with positive results are shown on Table 4-2.

The public water supply overlays were developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of groundwater and surface waters for both community and non-community supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlays also show the distribution systems for the public water supplies.

Nearly all of the population in Northampton receives their potable water from the Northampton Water District. A small amount of people in Northampton receive their potable water from Easthampton. The Water District obtains its water from two wells and five reservoirs. Two of the reservoirs are located in Northampton, two are located in Whately and one is located in Williamsburg. Both wells and the one reservoir located in Williamsburg were tested for Aldicarb, Carbofuran, Oxamyl, and Dinoseb with no positive results occurring.

As part of the DEQE sampling program five sites in Northampton were sampled for one or more of Aldicarb, Carbofuran, Oxamyl, Alachlor, and Dinoseb. One

sample site had positive result for Aldicarb. Ethylene Dibromide and 1,2-Dichloropropane were not tested for. The positive result for Aldicarb was less than the IDWG limit. The positive result was in the Ventures Field Road area of Northampton.

Examination of the 1972 and 1985 Agricultural Land Use overlays in the area where agricultural chemical contamination has occurred indicates that the contamination may be from nearby fields. The 1985 Land Use overlays show that this area was used to grow corn and there was a large amount of tilled field. In 1972 this land was used to grown corn and mixed vegetables. There were also tilled fields in the area. Table 2-3 lists the chemicals that are recommended by the New England Agricultural Extension Service for each crop type. Aldicarb was recommended for use on potatoes in 1985. While not evident on the aerial photos used for this study, potatoes could have been grown in previous years in the nearby fields.

A review of the public water distribution systems indicates that the area with contamination presently does not have public water. The nearest public water supply is located about one-half mile from the contamination. The Land Use overlays indicate that there is agricultural activity in the Roberts Meadow reservoir watershed consisting of corn and harvested grasses. The overlays also show tilled fields and pasture.

### 5.13.3 Recommendations For Northampton

The majority of residents in Northampton receive their potable water from the Northampton Water District. Consequently, the threat of consumption of agricultural chemical contaminated water is small. The Water District should be able to monitor for and detect contamination and implement corrective measures prior to distribution.

Since there is agricultural activity in the watershed of Roberts Meadow Reservoir, the Northampton Water District should sample the reservoir for contamination from chemicals associated with agricultural activities. From Table 2-3, the list of recommended chemicals for the crops grown in the watershed is extensive. Prior to sampling for these chemicals, surveys of chemical usage on nearby fields should be made to determine which chemicals to sample for.

The sampling program should also be expanded to those areas that do not have a public water supply and have agricultural activity (as shown on the 1972 and 1985 Agriculture Land Use Overlays) including portions of North Farm Road, Kennedy Road, Silvester Road, and Ventures Field Road. The chemicals that should be sampled for include those chemicals that are recommended and/or are normally used for the crops generally grown in the areas of concern.

TABLE 5-13

NORTHAMPTON
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
| Corn | 1623 | 34 | 723 | 30 | -900 | -56 |
| Pasture | 385 | 8 | 290 | 12 | -95 | -25 |
| Tilled | 1581 | 33 | 683 | 29 | -898 | -57 |
| Harvested Grasses | 0 | 0 | 419 | 18 | 419 | - |
| Tobacco | 90 | -2 | 0 | 0 | -90 | -100 |
| Orchard | 60 | 1 | 32 | 1 | -28 | -47 |
| Mixed Vegetables | 913 | 19 | 117 | -5 | -796 | -87 |
| Golf Course | 158 | 3 | 116 | -5 | -42 | -27 |
| Nursery | 0 | 0 | 0 | 0 | 0 | - |
| TOTAL | 4810 | 100 | 2380 | 100 | -2430 | -50 |

Area of Town 22,144

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.

AGRICULTURAL LAND USE

NORTHAMPTON


# Connecticut River Valley Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply

1985 AGRICULTURAL
LAND USE

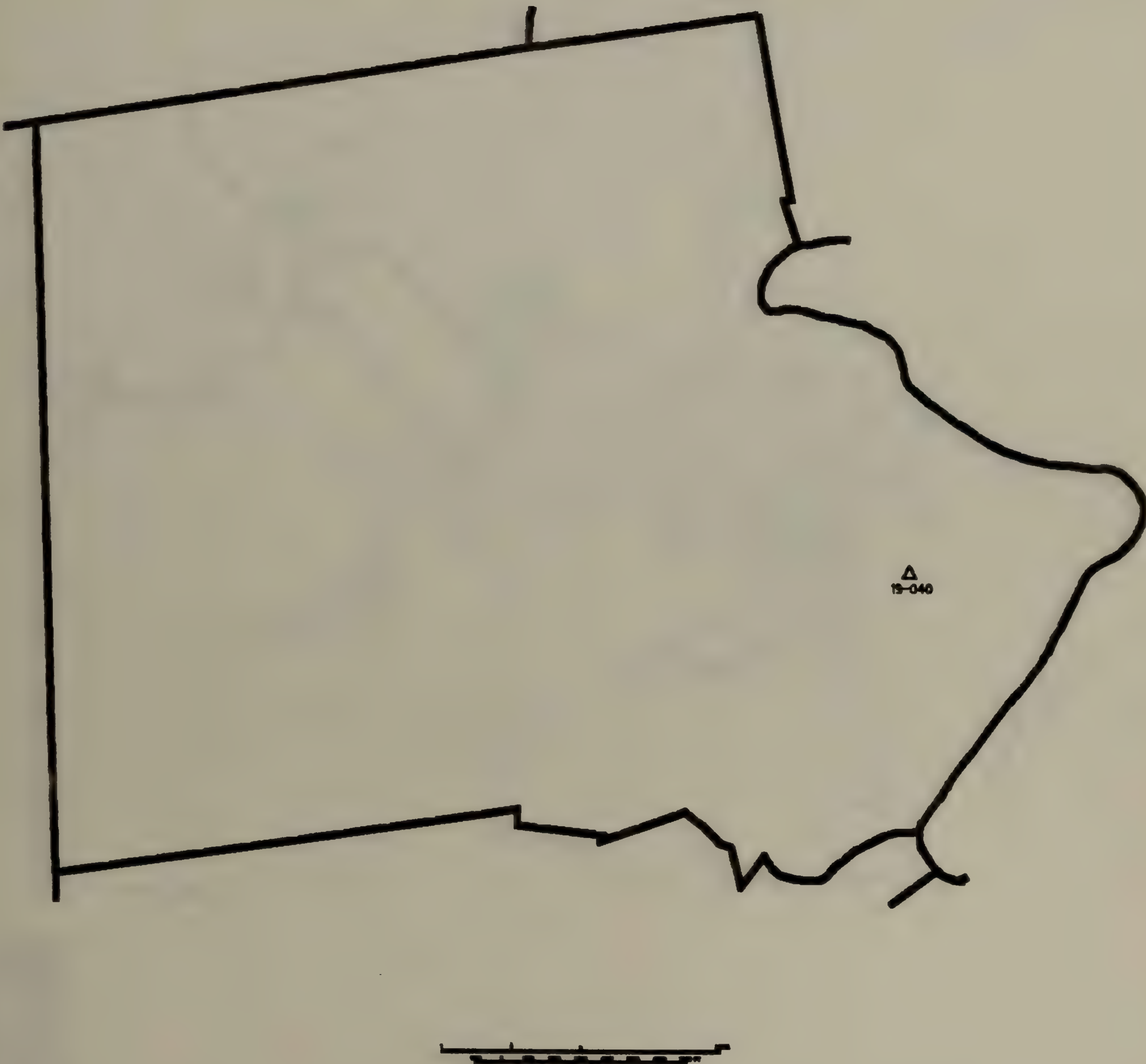
NORTHAMPTON
MASSACHUSETTS


# Connecticut River Valley Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

AGRICULTURAL CHEMICALS

NORTHAMPTON
MASSACHUSETTS




LEGEND-AGRICULTURAL CHEMICALS

| [illegible] | [illegible] | | [illegible] | [illegible] | |
|---|---|---|---|---|---|
| | [illegible] | [illegible] | | [illegible] | [illegible] |
| ETHYLENE DIBROMIDE | | | [illegible] | | |
| ALDICARB | | | [illegible] | | |
| ALACHLOR | | | | | |
| CARBOFURAN | | | | | |
| 1,2-DICHLOROPROPANE | | | | | |

# Connecticut River Valley Pesticide Study

[illegible]

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

WATER SUPPLY

NORTHAMPTON
MASSACHUSETTS


WATER SUPPLY
LEGEND

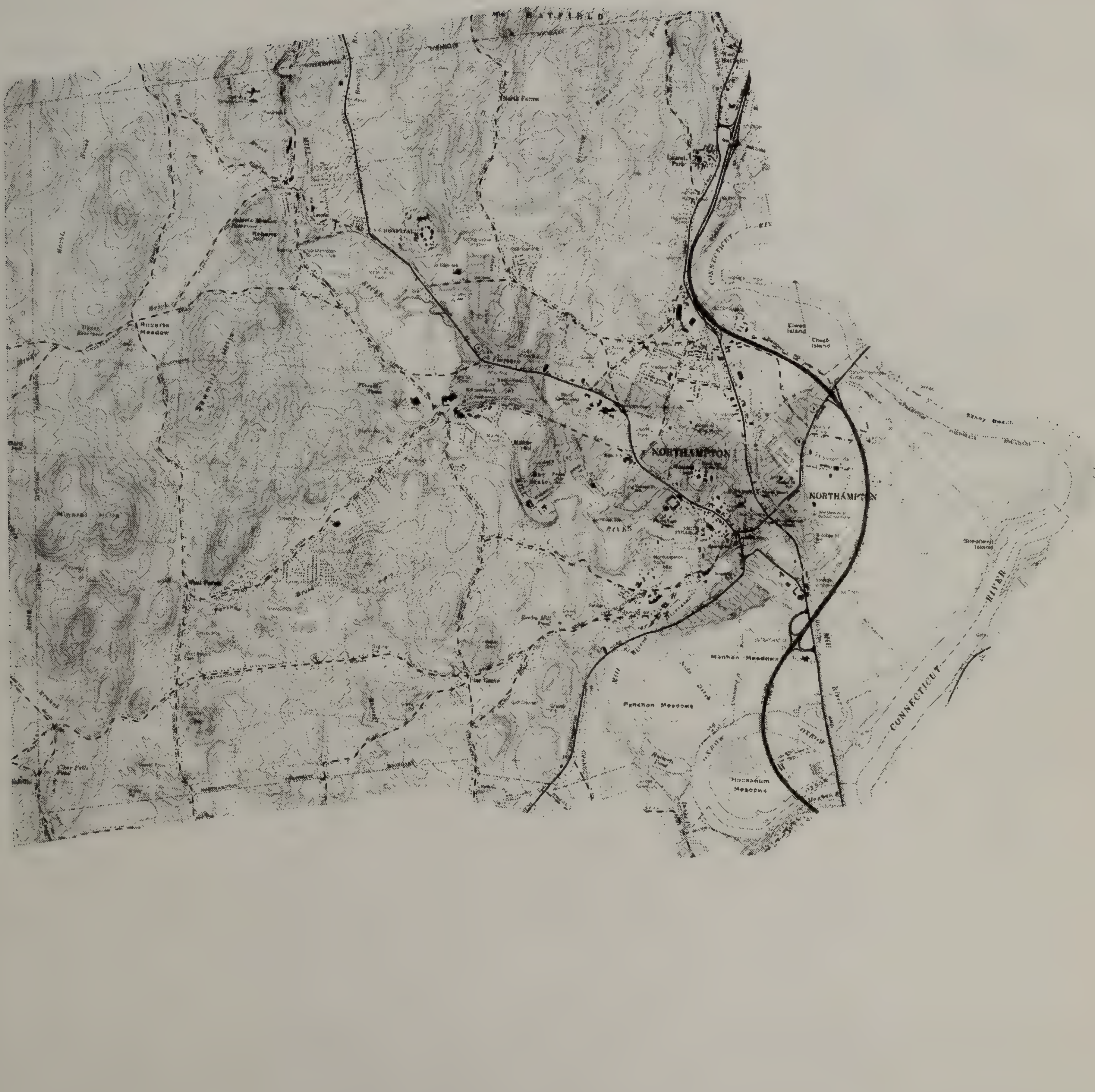
| SYMBOL | DESCRIPTION |
| --- | --- |
| | [illegible] |
| | [illegible] |
| | [illegible] |
| | [illegible] |
| | STORAGE TANK |
| | SPRING |

LEGEND-WATER SUPPLY PIPELINES

| PIPE DIA. (IN) | SYMBOL | PIPE DIA. (IN) | SYMBOL |
| --- | --- | --- | --- |
| 4 | | 16 | |
| 6 | | 18 | |
| 8 | | 20 | |
| 10 | | 24 | |
| 12 | | 30 | |
| 14 | | | |

# Connecticut River Valley Pesticide Study

PREPARED BY
[illegible]
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987


NORTHAMPTON
NORTHAMPTON
Manhan Meadows
Pynchon Meadows
CONNECTICUT
RIVER

## 5.14 NORTHFIELD

### 5.14.1 Agricultural Land Use

Between 1972 and 1985 the town of Northfield saw a reduction in the area of its land committed to agricultural production of over 1,400 acres or 34 percent.

The area committed to agriculture in Northfield in 1972 represented 18 percent of total town land area. The major portion (29 percent) of these land use types were identified as tilled. Table 5-14 lists acreages for each of the land use classifications mapped in this study in Northfield. Considering that these photographs were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (mixed vegetables) without chlorophyll sensitive film.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and the lack of chlorophyll information. These included pasture, harvested grasses, tilled and mixed vegetables. The difficulties in separating these land use types did not lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide-related land use types, corn was the most common crop and was grown on about 44 percent of the total area committed to agriculture. Golf courses accounted for about 2 percent of the total. Tobacco, orchards and nurseries were not found during 1972.

By 1985, agricultural land use in the study area had shifted considerably. At that time only 12 percent of the overall land in Northfield remained committed to agriculture. The total area of farmland was down to 2,776 acres, a drop of 1,414 acres or 34 percent from the 1972 total.

Within Northfield the tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of till is still inflated, however, over the normal midsummer conditions because of the late September photography. The land use classifications most likely to be affected by this situation include corn, harvested grasses and mixed vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall land use delineation is, however, far more accurate and precise than that made for 1972. Corn and harvested grasses were the major agricultural types and represent about 48 and 35 percent, respectively, of the land area mapped in Northfield. Harvested grasses may, however, include winter wheat due to the end of season photography date. Pasture and tilled were the next most common land use types mapped, accounting for 10 and 4 percent, respectively, of the area. Golf courses, mixed vegetables and orchards were the next most important agricultural land uses and accounted

for a combined total of about 3 percent of the land in Northfield. Tobacco and nurseries were not represented at all.

### 5.14.2 Water Supply and Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20 town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **No sites were sampled in Northfield; consequently, no sites are shown on the Agricultural Chemical overlay.**

The public water supply overlays were developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of ground and surface waters for both community and non-community supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlays also show the distribution systems for the public water supplies.

Approximately 60 percent of the population in Northfield receives their potable water from one of two public sources. About half of the public water is supplied by the Northfield Water District. The water district obtains its water from one well and one reservoir. The water district also has a second well which is not presently in use. The other half of the public water is supplied by a system owned by the East Northfield Water Company and operated by the Mount Herman School. The school receives its water from one reservoir.

No water sources in Northfield have been sampled as part of the DEQE sampling program. However, the water department well in use is adjacent to active farming and is a shallow aquifer well (18 ft). Therefore, the potential for contamination exists. Crops grown in 1985 in the vicinity of the well include harvested grasses and corn.

### 5.14.3 Recommendations for Northfield

For those residents who receive their potable water from the East Northfield Water Company the threat of consumption of agricultural chemical contaminated water is small since the water company's water supply comes from a reservoir with no agricultural activity in its watershed. In addition, the water company should be able to monitor for and detect contamination, and implement corrective measures prior to distribution of the water.

The potential for contamination of the Northfield Water District well exists since it is a shallow well adjacent to agricultural activity. The water district should sample the well for chemicals that have been used on the adjacent fields in recent years.

About 40 percent of the population in Northfield receive their potable water from private wells. Some of these wells are in areas of active agricultural activity. A sampling program should be implemented to include these wells. From Table 2-3, the list of chemicals recommended by the New England Agricultural Extension Service for the crops grown in the vicinity of the well is extensive. Prior to sampling, surveys of chemical usage on nearby fields should be made to determine which chemicals to sample for.

The sampling program should be expanded to areas where the only source of potable water is from private wells and where agricultural activity (as shown on the 1972 and 1985 Agricultural Land Use Overlays) is occurring. These areas include:

Pine Meadow Road

Wannamaker Road

Portions of Main Street, Pierson Road, and Mt. Herman Station Road

The Moose Plain Area

Surveys of actual chemical usage in the nearby fields should be made prior to implementing a sampling program.

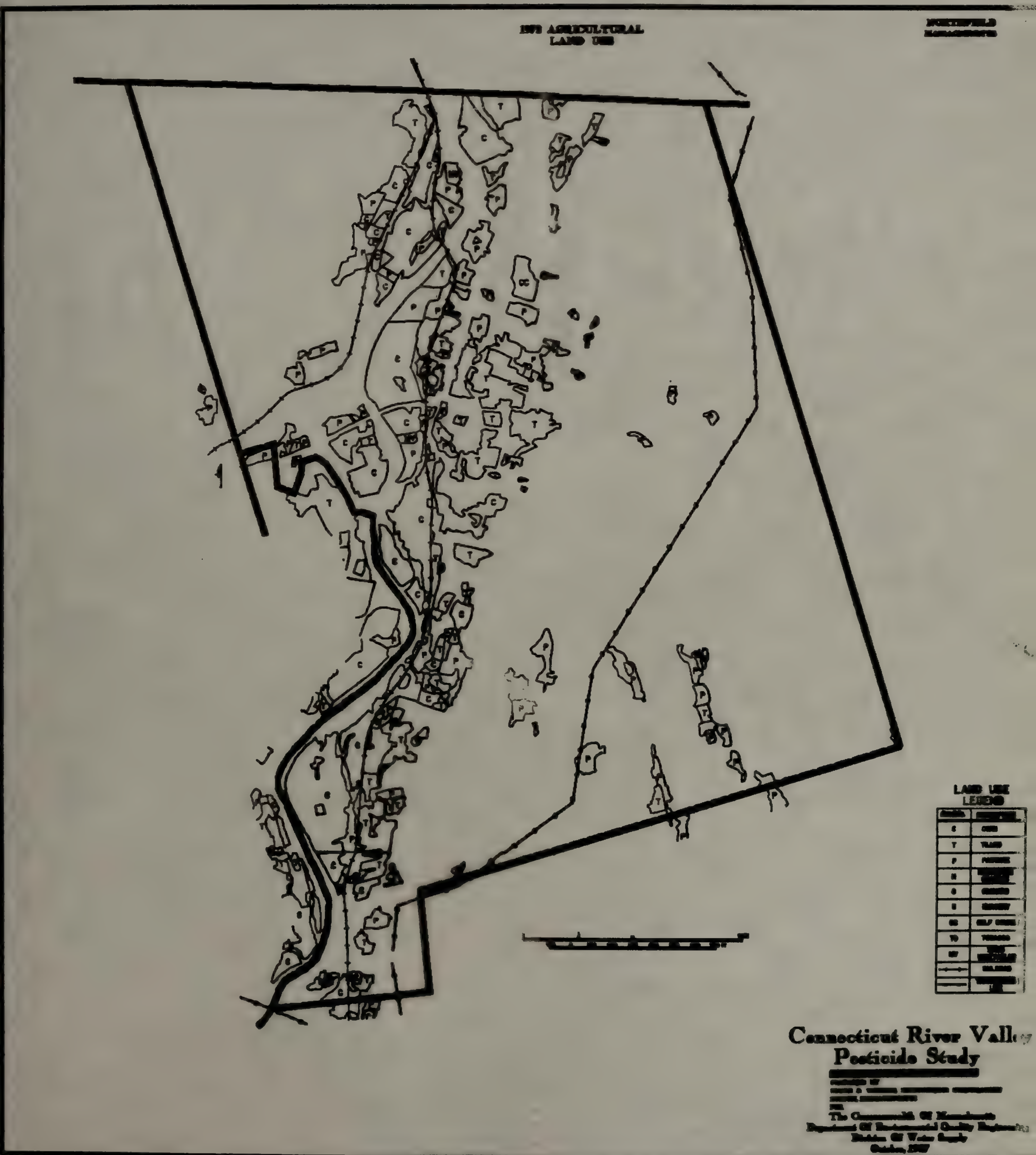
TABLE 5-14

NORTHFIELD
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
| Corn | 1835 | 44 | 1339 | 48 | -496 | -27 |
| Pasture | 1212 | 29 | 263 | 10 | -949 | -78 |
| Tilled | 1054 | 25 | 114 | 4 | -940 | -89 |
| Harvested Grasses | 0 | 0 | 980 | 35 | 980 | - |
| Tobacco | 0 | 0 | 0 | 0 | 0 | - |
| Orchard | 0 | 0 | 14 | <1 | 14 | - |
| Mixed Vegetables | 28 | 1 | 19 | 1 | -9 | -32 |
| Golf Course | 61 | 2 | 47 | 2 | -14 | -23 |
| Nursery | 0 | 0 | 0 | 0 | 0 | - |
| TOTAL | 4190 | 100 | 2776 | 100 | -1414 | -34 |

Area of Town 22,656

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.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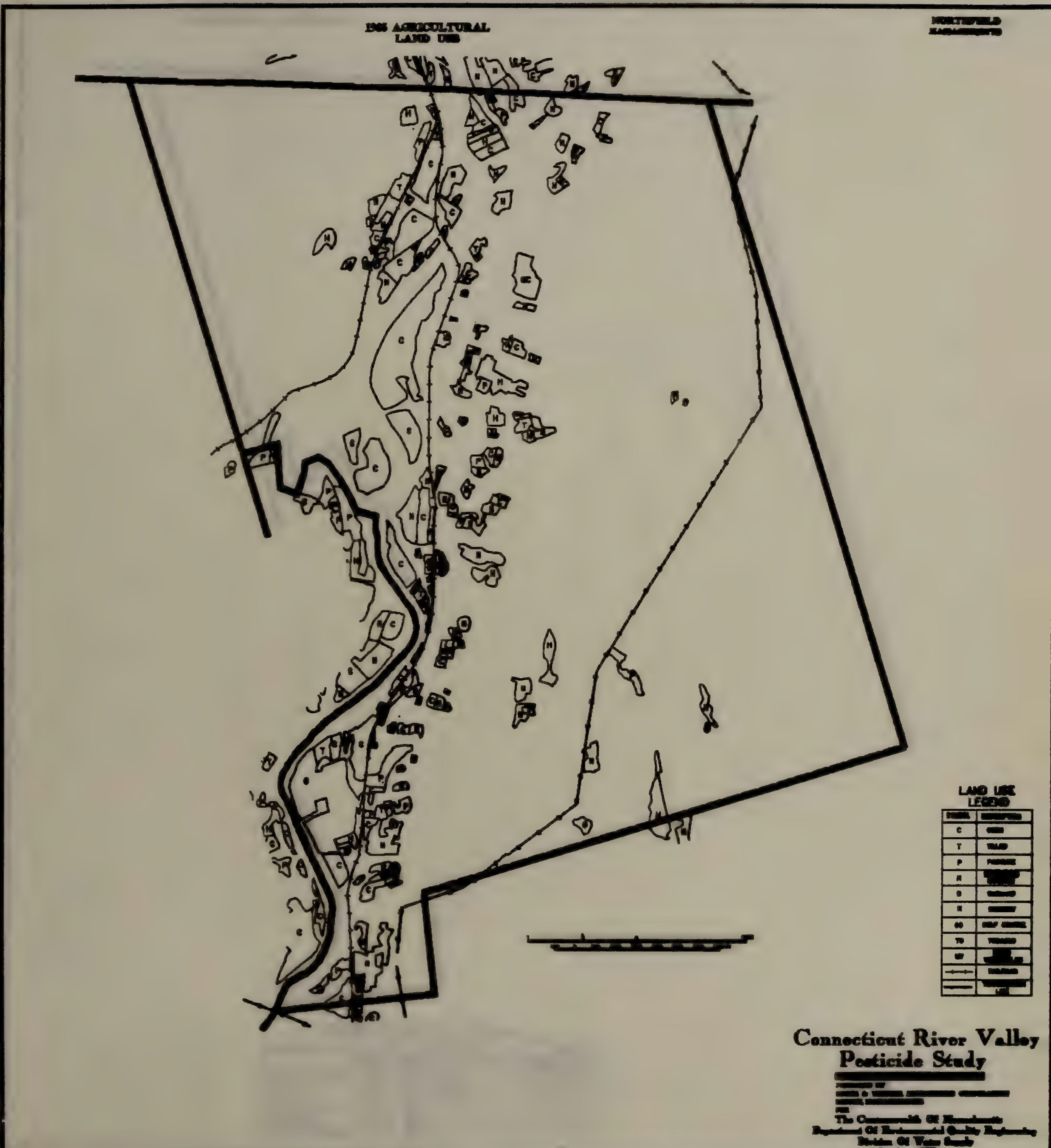
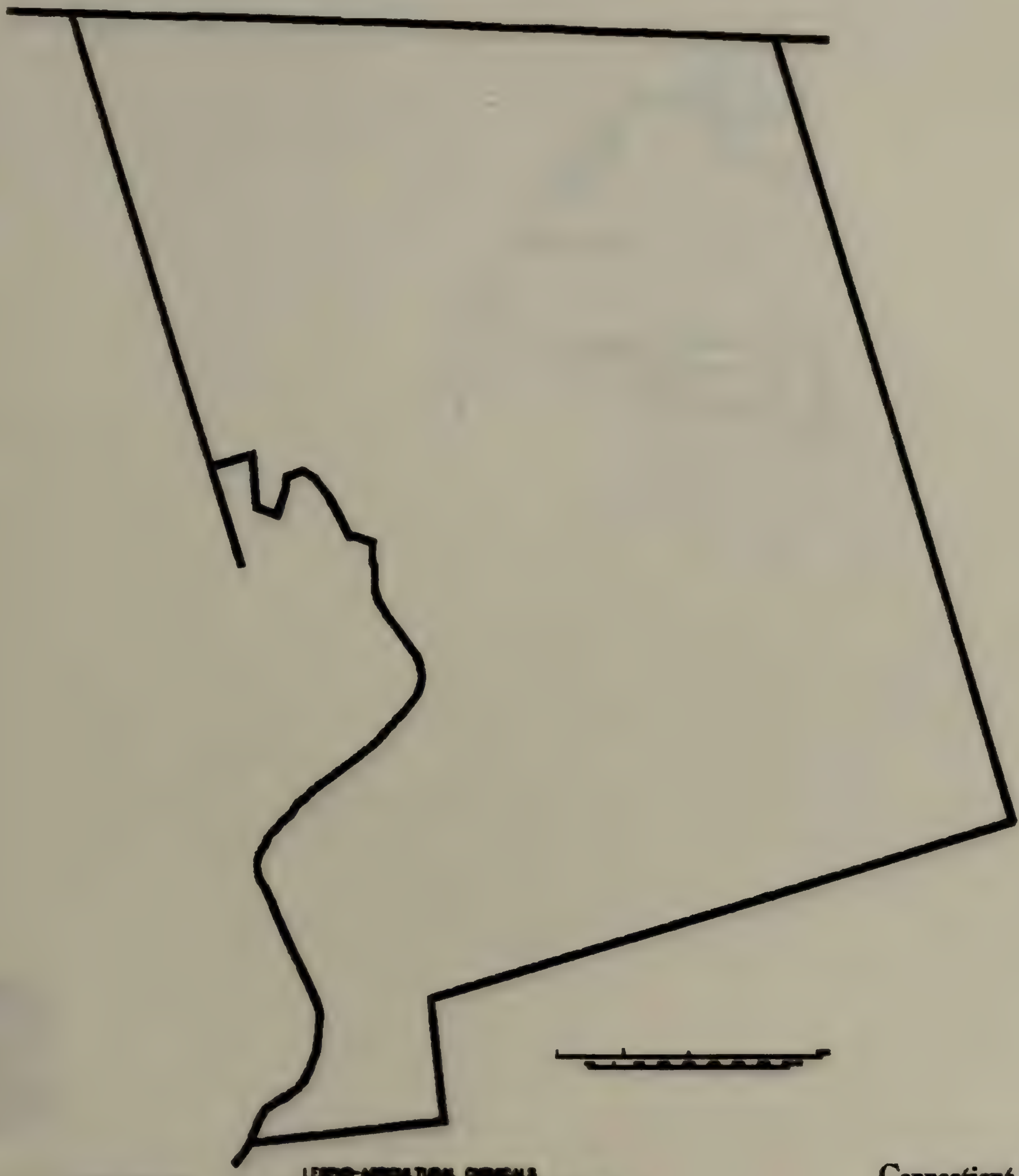
LAND USE
LAND USE
LEGEND
Connecticut River Vall
Pesticide Study


AGRICULTURAL
LAND USE
NORTHFIELD
LAND USE
LEGEND
Connecticut River Valley
Pesticide Study

AGRICULTURAL CHEMICALS

NORTHFIELD
MASSACHUSETTS



LEGEND-AGRICULTURAL CHEMICALS

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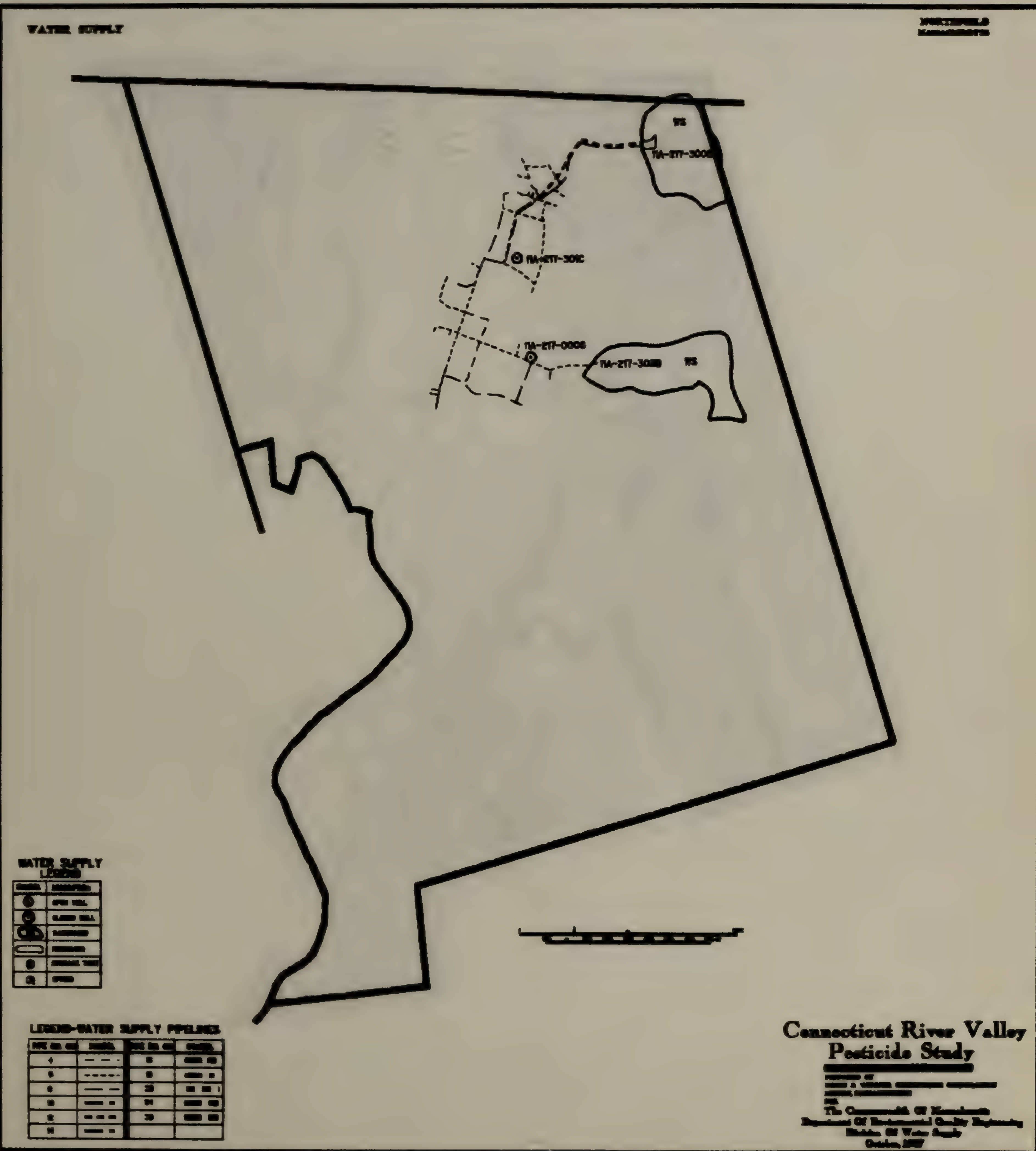
|---|---|---|---|---|---|
| | [illegible] | [illegible] | | [illegible] | [illegible] |
| ETHYLENE DIBROMIDE | | | [illegible] | | |
| ALDICARB | | | [illegible] | | |
| ALACHLOR | | | | | |
| CARBOFURAN | | | | | |
| 1,2-DICHLOROPROPANE | | | | | |

Connecticut River Valley
Pesticide Study

[illegible]

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987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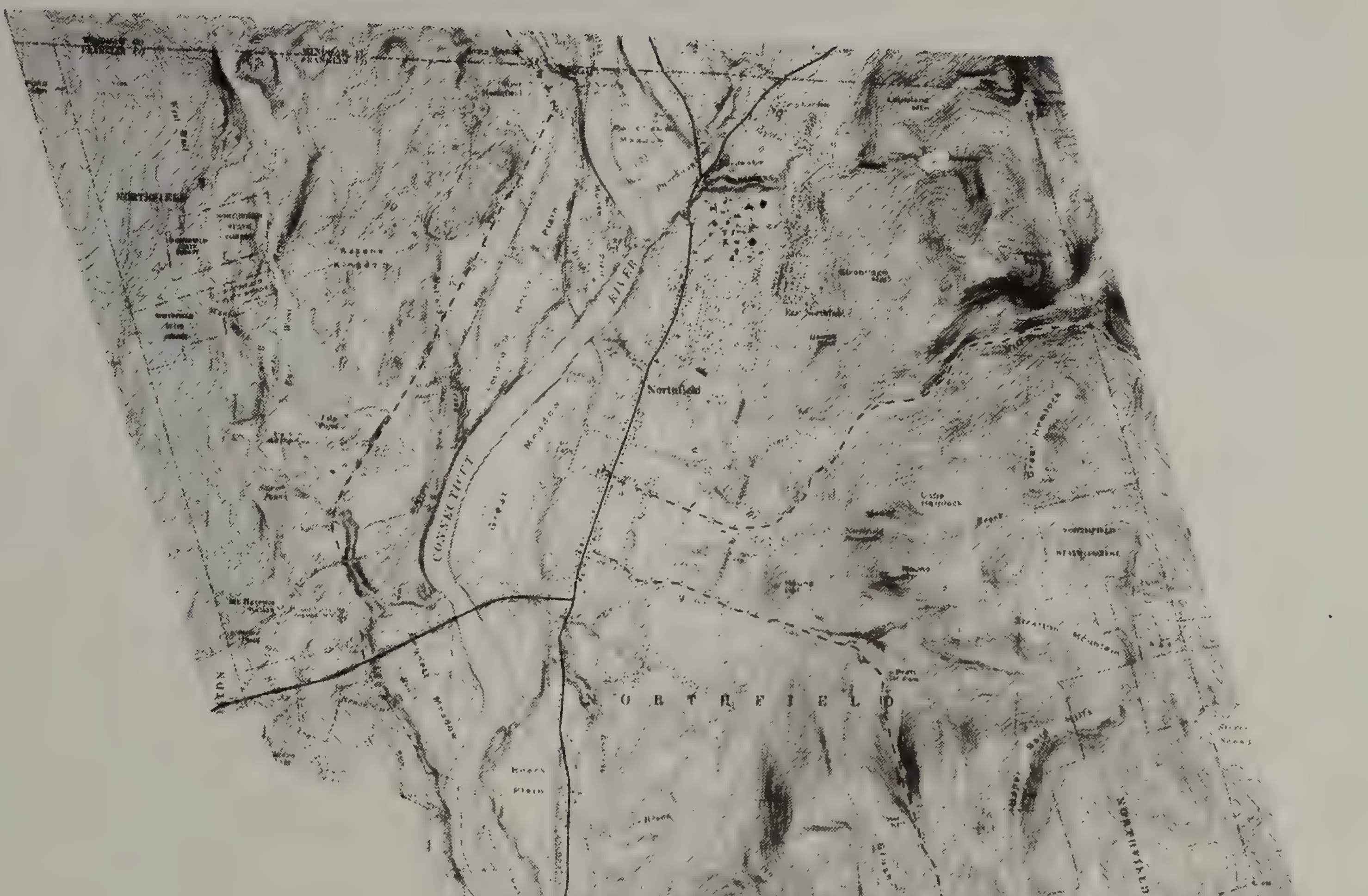
WATER SUPPLY LEGEND
LEGEND-WATER SUPPLY PIPELINES
Connecticut River Valley
Pesticide Study



NORTHFIELD
CONNECTICUT RIVER
Northfield
NORTHFIELD STATE FOREST
CONNECTICUT
RIVER

## 5.15 SOUTH HADLEY

### 5.15.1 Agricultural Land Use

Between 1972 and 1985 the town of South Hadley saw a reduction in the area of its land committed to agricultural production of over 1000 acres or 46 percent. The largest overall changes were in land use types which were reclassified using the improved 1985 photography, such as pasture, tilled and harvested grasses. Other than reclassified areas, corn had the only increase having gained 12 acres (6 percent) over its 1972 area. Table 5-15 lists acreages for each of the land use classifications mapped in this study in South Hadley.

The area committed to agriculture in South Hadley in 1972 represented 19 percent of total town land area. The major portion (47 percent) of the land use types were identified as tilled. Considering that these photographs were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (mixed vegetables) without chlorophyll sensitive film.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and the lack of chlorophyll information. These included pasture, harvested grasses, tilled and mixed vegetables. The difficulties in separating these land use types did not lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide-related land use types, corn was the most common crop and was grown on about 10 percent of the total area committed to agriculture. Golf courses, mixed vegetables and orchards accounted for a combined total of about 17 percent of the total. Tobacco and nurseries were not found during 1972.

By 1985, agricultural land use in the study area had shifted considerably. At that time only 10 percent of the overall land in South Hadley remained committed to agriculture. The total area of farmland was down to 1,179 acres, a drop of 1,012 acres or 46 percent from the 1972 total.

Within South Hadley, the tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of till is still inflated, however, over the normal midsummer conditions because of the late September photography. The land use classifications most likely to be affected by this situation include corn, harvested grasses and mixed vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall land use delineation is, however, far more accurate and precise than that made for 1972. Harvested grasses was the major agricultural type and represents about 36 percent of the land area mapped in South Hadley. Harvested grasses may, however, include winter wheat due to the end of season photography date. Corn and pasture were the next most common land

use type mapped accounting for 23 and 19 percent, respectively, of the area. Mixed vegetables, tilled and orchards were the next most important agricultural land uses and accounted for a combined total of about 9 percent of the land in South Hadley. Tobacco and nurseries were not represented at all.

### 5.15.2 Water Supply and Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20 town study area for this project, 358 ground and surface water sources were sampled for at least one chemical. **In South Hadley, four sites were sampled with no sites having a positive result.** Table 4-1 lists the sample locations with the sample results.

The public water supply overlays were developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of groundwater and surface waters for both community and noncommunity supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlays also show the distribution systems for the public water supplies.

Nearly all of the population in South Hadley receives their potable water from a public source. South Hadley has two sources of public water. Roughly 67 percent of public water is supplied by the South Hadley Fire District No. 1 and 33 percent is served by South Hadley Fire District No. 2. Fire District No. 1 presently obtains its water from the Quabbin Reservoir via the Chicopee Valley Aqueduct. The reservoir operated by Fire District No. 1 is presently not in operation. Fire District No. 2 obtains its water from three wells and one reservoir. Two wells are recharged by the reservoir, which is presently the reservoir's only function. The well not recharged by the reservoir was tested for all seven chemicals with no positive results occurring.

### 5.15.3 Recommendations for South Hadley

The majority of residents in South Hadley receive their potable water from the Quabbin Reservoir. However, about one-third of the potable water used in South Hadley originates from a groundwater source. One public well which is next to the Connecticut River is near cultivated farm land. The 1972 and 1985 Agricultural Land Use overlays show that fields in this general area have been used to grow harvested grasses. The overlays also show tilled fields and pastures. Future contamination of this well is possible, though recharge of the well is probably from the Connecticut River, which should minimize the threat of contamination.

The threat of consumption of agricultural chemical contaminated water is small because Fire District No. 2 should be able to detect contamination and implement corrective measures prior to distribution of the water. However, Fire District No. 2 should continue to monitor the well adjacent to the Connecticut River, at least annually, for contamination. A survey of

chemical usage on the adjacent fields should also be performed to determine which chemicals should be sampled for.

TABLE 5-15

SOUTH HADLEY
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | Difference 1985-1972 | % Change |
| Corn | 213 | 10 | 225 | 19 | 12 | 6 |
| Pasture | 581 | 26 | 274 | 23 | -307 | -53 |
| Tilled | 1305 | 47 | 30 | 2 | -1005 | -97 |
| Harvested Grasses | 0 | 0 | 426 | 36 | -126 | - |
| Tobacco | 0 | 0 | 0 | 0 | 0 | - |
| Orchard | 45 | 2 | 11 | 1 | -34 | -76 |
| Mixed Vegetables | 151 | 7 | 63 | 5 | -88 | -58 |
| Golf Course | 166 | 8 | 150 | 13 | -16 | -10 |
| Nursery | 0 | 0 | 0 | 0 | 0 | - |
| TOTAL | 2191 | 100 | 1179 | 100 | -1012 | -46 |
| Area of Town | 11,328 | | | | | |

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.


AGRICULTURAL
LAND USE
SOUTH HADLEY
LAND USE
LEGEND
Connecticut River Valley
Pesticide Study

1986 AGRICULTURAL
LAND USE

SOUTH HADLEY


# Connecticut River Valley Pesticide Study

AGRICULTURAL CHEMICALS

SOUTH HADLEY
MASSACHUSETTS

LEGEND-AGRICULTURAL CHEMICALS

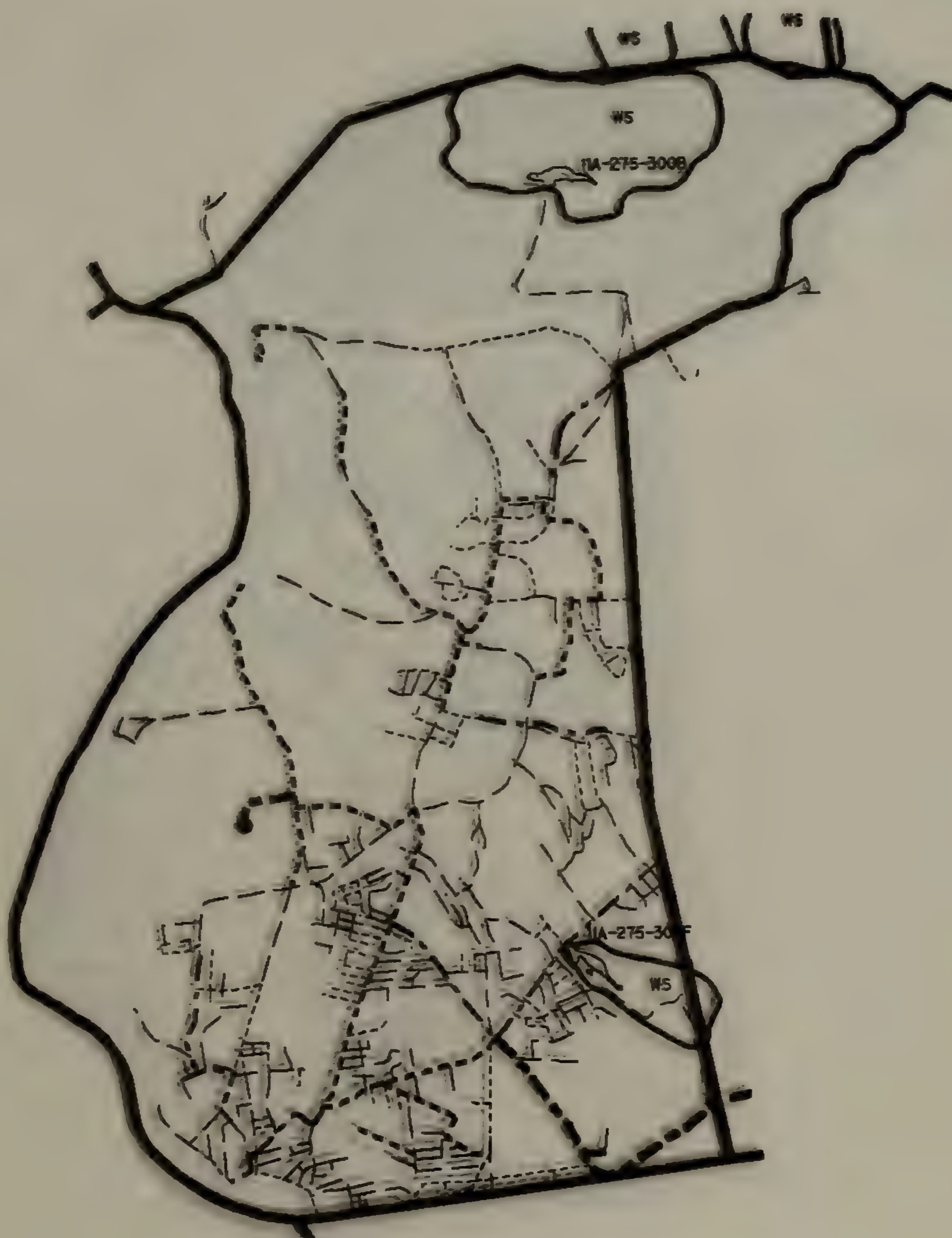
| AGRICULTURAL CHEMICALS | SYMBOL | | AGRICULTURAL CHEMICALS | SYMBOL | |
|---|---|---|---|---|---|
| | PRESENT | PAST | | PRESENT | PAST |
| ETHYLENE DIBROMIDE | □ | ■ | OXAMYL | X | X |
| ALDICARB | △ | ▲ | DINOSEB | D | D |
| ALACHLOR | ▽ | ▼ | | | |
| CARBOFURAN | ◇ | ◆ | | | |
| 1,2-DICHLOROPROPANE | + | + | | | |

# Connecticut River Valley Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

WATER SUPPLY

SOUTH HADLEY
MASSACHUSETTS




LEGEND

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LEGEND-WATER SUPPLY

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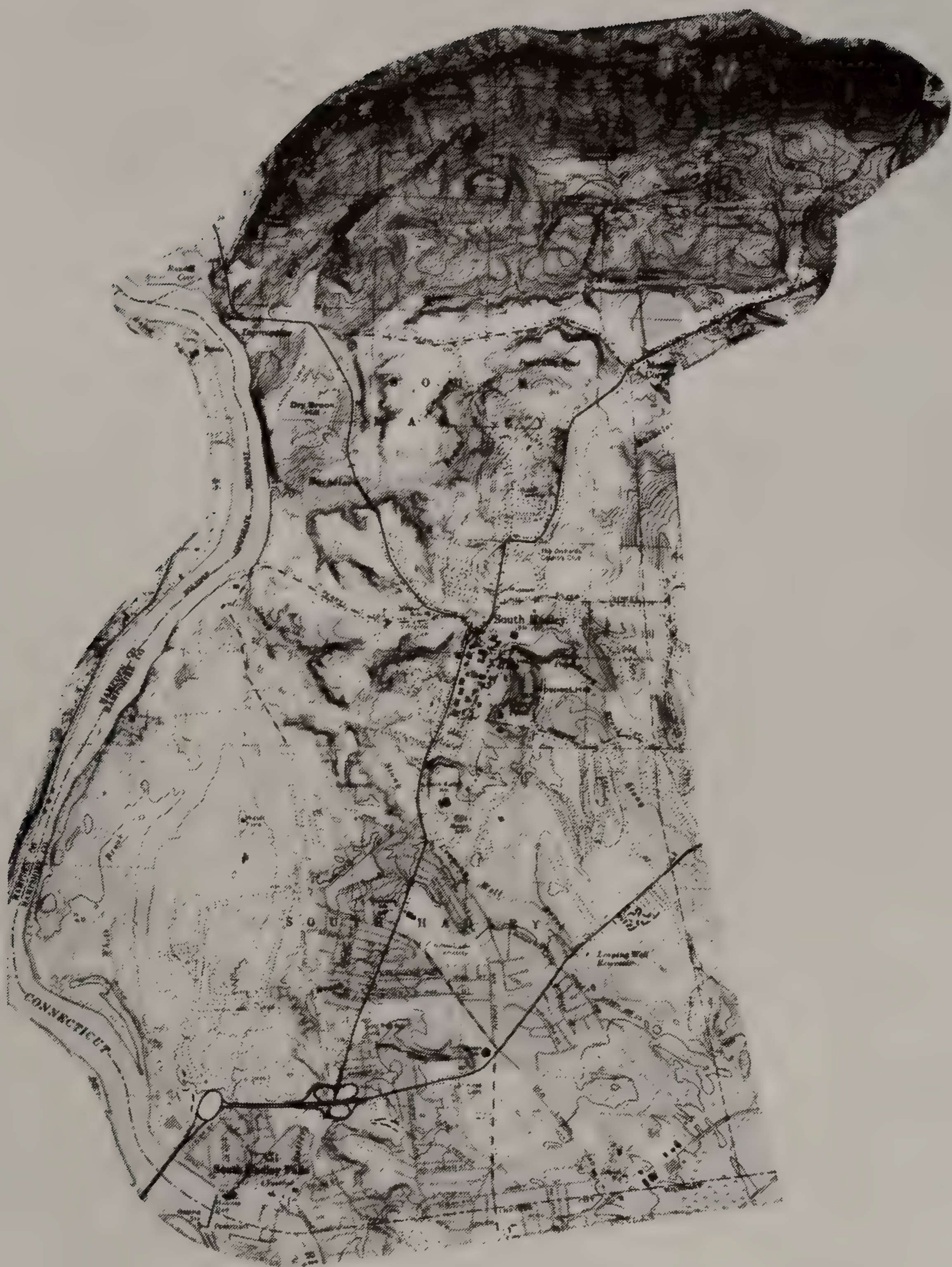
# Connecticut River Valley Pesticide Study

[illegible]

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
Date February, 1987


CONNECTICUT

5.16 SOUTHAMPTON

5.16.1 Agricultural Land Use

Between 1972 and 1985 the town of Southampton saw a reduction in the area of its land committed to agricultural production of over 900 acres or 28 percent. Table 5-16 lists acreage for each of the land use classifications mapped in this study in Southampton.

The area committed to agriculture in Southampton in 1972 represented 18 percent of total town land area. The major portion (39 percent) of these land use types were identified as tilled. Considering that these photographs were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (mixed vegetables) without chlorophyll sensitive film.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and the lack of chlorophyll information, These included pasture, harvested grasses, tilled and mixed vegetables. It is important to note, however, that the difficulties in separating these land use types did not also lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide-related land use types, corn was the most common crop and was grown on about 21 percent of the total area committed to agriculture. Golf courses, mixed vegetable and orchards accounted for a combined total of about 6 percent of the total. Tobacco and nurseries were not found during 1972.

By 1985, agricultural land use in the study area had shifted considerably. At that time only 10 percent of the overall land in Southampton remained committed to agriculture. The total area of farmland was down to 2403 acres: a drop of 926 acres of 28 percent from the 1972 total.

Within Southampton the tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of all areas where vegetation had been removed. The acreage of till is still inflated, however, over the normal mid-summer conditions because of the late September photography. The land use classifications most likely to be affected by this situation includes corn, harvested grasses and mixed vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall land use delineation is, however, far more accurate and precise than that made for 1972. Harvested grasses was the major agricultural type and represent about 37 percent of the land area mapped in Southampton. Pasture and corn were the next most common land use type mapped accounting for 25 and 24 percent, respectively, of the area. Mixed vegetables and orchards were the next most important agricultural land uses and accounted for a combined total of about 3 percent of the land in Southampton. Tobacco, golf courses and nurseries were not found in 1985.

5.16.2 Water Supply & Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20 town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Southampton, three sites were sampled, with two having positive results.** Table 4-1 lists the sample locations with the sample results.

The positive results were shown on the Agricultural Chemicals overlay as either a light character or a dark character depending on whether or not the concentration measured was over the Massachusetts Interim Drinking Water Guidelines (IDWG). The dark characters represent locations where the concentrations found were over the guidelines. The light characters represent locations where the concentrations were less than or equal to the IDWG **or where the concentrations were at one time over the IDWG but on subsequent sampling were found to be less than the IDWG or not detected at all.** Table 2-4 lists the IDWG for the seven agricultural chemicals. The locations with positive results are labeled with a map number and the well depth, if applicable or available. The map numbers for the locations with positive results are shown on Table 4-2.

The public water supply overlays were developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of goundwater and surface waters for both community and noncommunity supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlays also show the distribution systems for the public water supplies.

Approximately 44 percent of the population in Southampton receives its potable water from the Southampton Water Department. The remainder of the population receives its water from private wells. The Southampton Water Department presently obtains its water from one well and one reservoir. The reservoir, which supplies a majority of the water, is operated by the Holyoke Water Department. The water department has also in the past proposed construction of a well in the Pequot Pond area. The well was tested for all seven chemicals with a positive result occurring for 1,2-Dichloropropane. The positive result was less than the IDWG limit.

As part of the DEQE sampling program, three sites in Southampton were sampled (two were public water; one of these was the Southampton Water Department well) for one or more of the seven agricultural chemicals. Two of the three sample sites had positive results for 1,2-Dichloropropane. Neither of the positive results for 1,2-Dichloropropane were above the IDWG.

When the 1972 and 1985 Agricultural Land Use overlays are examined for the areas where agricultural chemical contamination exists, they indicate that contamination may not be from nearby agricultural chemical applications.

While both areas where contamination occurred are surrounded by fields containing harvested grasses and pasture land, both wells are about 160 ft deep which would indicate that the contamination may have come from another area entirely.

A review of the public water distribution systems indicates that the well where contamination occurred is adjacent to public water.

5.16.3 Recommendations For Southampton

The majority of the population of Southampton receives their potable water from groundwater sources. However, the threat of consumption of agricultural chemical contaminated water in excess of the state's IDWG limits is small for the residents in Southampton who receive their potable water from the Southampton Water Department. Since the majority of water supplied by the Water Department is from the reservoir and the Water Department should be able to monitor for and detect contamination in their well, any required corrective measures can be taken prior to distribution of water to their customers.

The water department should continue to monitor their well at least annually for contamination. They should also consider implementing a study as described at the beginning of Section 5 to determine the source of contamination of their well.

The sampling program should be expanded to those areas in Southampton where no public water exists and farming occurs. The areas include: the whole southeast portion of Southampton, the Russelville area, south of Swanson Corners, the Glendale Road, Domiroy Meadow Road, and in northern Southampton. As shown in Table 2-3, the list of chemicals recommended by the New England Agricultural Extension Service for the crops grown in these areas as shown on the overlays is extensive. Prior to sampling for any chemicals, surveys of chemical usage on nearby fields should be made to determine which chemicals to sample for.

TABLE 5-16

SOUTHAMPTON
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | Difference 1985-1972 | % Change |
| Corn | 694 | 21 | 577 | 24 | -177 | -17 |
| Pasture | 1147 | 34 | 607 | 25 | -540 | -47 |
| Tilled | 1301 | 39 | 259 | 11 | -1042 | -80 |
| Harvested Grasses | 0 | 0 | 881 | 37 | 881 | -- |
| Tobacco | 0 | 0 | 0 | 0 | 0 | -- |
| Orchard | 18 | <1 | 20 | 1 | 2 | 11 |
| Mixed Vegetables | 54 | 2 | 59 | 2 | 5 | 9 |
| Golf Course | 115 | 4 | 0 | 0 | -115 | -100 |
| Nursery | 0 | 0 | 0 | 0 | 0 | -- |
| TOTAL | 3329 | 100 | 2403 | 100 | -926 | -28 |

Area of Town 18,496

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.

[illegible] AGRICULTURAL
LAND USE

SOUTHAMPTON
MASSACHUSETTS


# Connecticut River Valley
# Pesticide Study

[illegible]

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

1985 AGRICULTURAL
LAND USE

SOUTHAMPTON
MASSACHUSETTS


# Connecticut River Valley Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

AGRICULTURAL CHEMICALS

SOUTHAMPTON
MASSACHUSETTS


LEGEND-AGRICULTURAL CHEMICALS

| AGRICULTURAL CHEMICALS | SYMBOL | | AGRICULTURAL CHEMICALS | SYMBOL | |
|---|---|---|---|---|---|
| | PRESENT | OVER | | PRESENT | OVER |
| ETHYLENE DIBROMIDE | □ | ■ | [illegible] | × | ✖ |
| ALDICARB | △ | ▲ | DINOSEB | D | [illegible] |
| ALACHLOR | ▽ | ▼ | | | |
| CARBOFURAN | ◇ | ◆ | | | |
| 1,2-DICHLOROPROPANE | + | ✚ | | | |

# Connecticut River Valley Pesticide Study

[illegible]

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987


WATER SUPPLY
SOUTHAMPTON
WS
11A-276-304B
11A-276-303B
11A-276-300A
11A-276-301C
WATER SUPPLY LEGEND
LEGEND-WATER SUPPLY PIPELINES
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14
16
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Connecticut River Valley
Pesticide Study
October, 1987


SOUTHAMPTON

## 5.17 SOUTHWICK

### 5.17.1 Agricultural Land Use

Between 1972 and 1985 the town of Southwick saw a 1417 acre or 28 percent reduction in the area of its land committed to agricultural production. The largest overall changes were in land use types which were reclassified using the improved 1985 photography, such as pasture, tilled and harvested grasses. Other than reclassified areas, corn and mixed vegetables had the largest change with an increase of 236 and 204 acres, respectively, over their 1972 areas.

The area committed to agriculture in Southwick in 1972 represented 26 percent of total town land area. The major portion (32 percent) of these land use types were identified as tilled. (Table 5-17 lists acreages for each of the land use classifications mapped in this study in Southwick.) Considering that the photographs used in this study were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (mixed vegetables) without chlorophyll sensitive film.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and the lack of chlorophyll information. These included pasture, harvested grasses, tilled and mixed vegetables. The difficulties in separating these land use types did not lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide related land use types, tobacco and corn, were the most common crops and were grown on about 15 and 9 percent, respectively, of the total area committed to agriculture. Golf courses are next with 7 percent. Orchards and nurseries accounted for a combined total of about 1 percent of the total.

By 1985, agricultural land use in the study area had shifted considerably. At that time only 10 percent of the overall land in Southwick remained committed to agriculture. The total area of farmland was down to 2403 acres: a drop of 926 acres or 28 percent from the 1972 total.

Within Southwick the tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of till is still inflated, however, over the normal mid-summer conditions because of the late September photography. The land use classifications most likely to be affected by this situation includes corn, harvested grasses and mixed vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall land use delineation is, however, far more accurate and precise than that made for 1972. Harvested grasses, corn and tilled were the major agricultural types and represent about 20, 19 and 19 percent, respectively, of the land area mapped in Southwick. Pasture, mixed vegetables, tobacco

and golf courses were the next most common land use type mapped accounting for 12, 11, 10 and 9 percent, respectively, of the area. Orchards accounted for the remaining percentage of the land mapped in Southwick. Nurseries were not found in 1985.

5.17.2 Water Supply and Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20 town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Southwick, 27 sites were sampled with 18 having positive results.** Table 4-1 lists the sample locations with the sample results.

Positive results are shown on the Agricultural Chemical overlay as either a light character or a dark character depending on whether or not the concentration measured was over the Massachusetts Interim Drinking Water Guidelines (IDWG). The dark characters represent locations where the concentrations found were over the guidelines. The light characters represent locations where the concentrations were less than or equal to the IDWG **or where the concentrations were at one time over the IDWG but on subsequent sampling were found to be less than the IDWG or not detected at all.** Table 2-4 lists the IDWG for the seven agricultural chemicals. The locations with positive results are labeled with a map number and the well depth, if applicable or available. The map numbers for the locations with positive results are shown on Table 4-2.

The public water supply overlay was developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlay shows location of groundwater and surface waters for both community and noncommunity supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlay also shows the distribution systems for the public water supplies.

Approximately 50 percent of the population of Southwick receives their potable water from the Southwick Water Department which obtains its water from one well. The Water Department can also obtain water from the Springfield Aqueduct.

As part of the DEQE sampling program, 27 sites in Southwick were sampled for Ethylene Dibromide and/or 1,2-Dichloropropane. No sampling was performed for the other five chemicals. Eighteen sample sites were found to have positive results for at least one chemical. Five sites have positive results for both chemicals. Three of these sites are West Springfield public wells which were shut down in 1984 for Ethylene Dibromide contamination.

Out of the 27 sample locations, 26 were sampled for Ethylene Dibromide in either 1984 or 1985, with nine having positive results. Seven of these

positive results were over the IDWG limits. Contamination for Ethylene Dibromide was generally located in a section of Sheep Pasture Road and the Great Brook area north of Feeding Hills Road.

Twenty-six of the 27 sample locations were sampled for 1,2-Dichloropropane, with 14 having positive results. Six of these positive results were over the IDWG limits. Contamination for 1,2-Dichloropropane was generally located in the North Loomis Street-Granville Road area west of the Congamond Lakes, and the Great Brook area.

Examination of the 1972 and 1985 Agricultural Land Use overlays for the areas where agricultural chemical contamination exists indicates that the contamination may be from nearby fields. The land use overlays show that in 1985, fields in the area of Sheep Pasture Road and west of the Congamond Lakes were used to grow corn, tobacco, and mixed vegetables and in 1972 this land was used to grow tobacco. The land use overlays show that in both 1972 and 1985, fields in the Great Brook area south of Feeding Hills Road were used primarily to grow mixed vegetables. The overlays show that in 1985 fields in the Great Brook Area north of Feeding Hills Road were used to grow tobacco and in 1972 this land was used to grow tobacco and corn. There is also a golf course nearby. The overlays show that in 1985, North Loomis Street-Granville Road area fields were used to grow corn and harvested grasses. The overlays also show tilled fields. In 1972 this land was used to grow corn and tobacco. In addition, there were pasture lands.

Table 2-3 lists the chemicals that were recommended by the New England Agricultural Extension Service for each crop type. Ethylene Dibromide was recommended for tobacco and berries in 1972 and was not recommended for any crop in 1985. 1,2-Dichloropropane was recommended for mixed vegetables, berries, and potatoes in 1972, and mixed vegetables, tree fruit, and nursery crops in 1985. 1,2-Dichloropropane has also been used on tobacco.

A review of the public water distribution systems indicates that several of the contaminated wells are near public water. The North Loomis Street - Granville Road area is about one-half mile from the Westfield Water Department System.

### 5.17.3 Recommendations for Southwick

The majority of the population of Southwick receives their potable water from groundwater sources. Contamination has been found in several areas of Southwick. The potential for additional contamination in Southwick exists.

For those residents who receive their potable water from the Southwick Water Department, the threat of consumption of Agricultural chemical contaminated water in excess of the State's IDWG is small since the Water Department should be able to monitor for and detect contamination and implement corrective measures prior to distribution of the water.

The Southwick Water Department should continue to monitor their well at least annually for agricultural chemical contamination. The water Department should consider implementing a study as described in the beginning of Section 5 to determine the source of contamination in their well.

The sampling program should be expanded to several areas in Southwick were public water does not exist and where active farming (as shown on the 1972 and 1985 Agricultural Land Use overlays) exists. These areas include:

The west side of Southwick

The Congamond Lakes and the surrounding area including the Sheep Pasture Road area

The northwest corner of Southwick

South of Round Hill

From Table 2-3 the list of recommended chemicals for the crops normally found in these areas is extensive. Prior to sampling for any chemicals, surveys of chemical usage on nearby fields should be made to determine which chemicals to sample for.

The Southwick Water Department should consider investigating a tie into the Westfield system to supply public water to those areas with contamination.

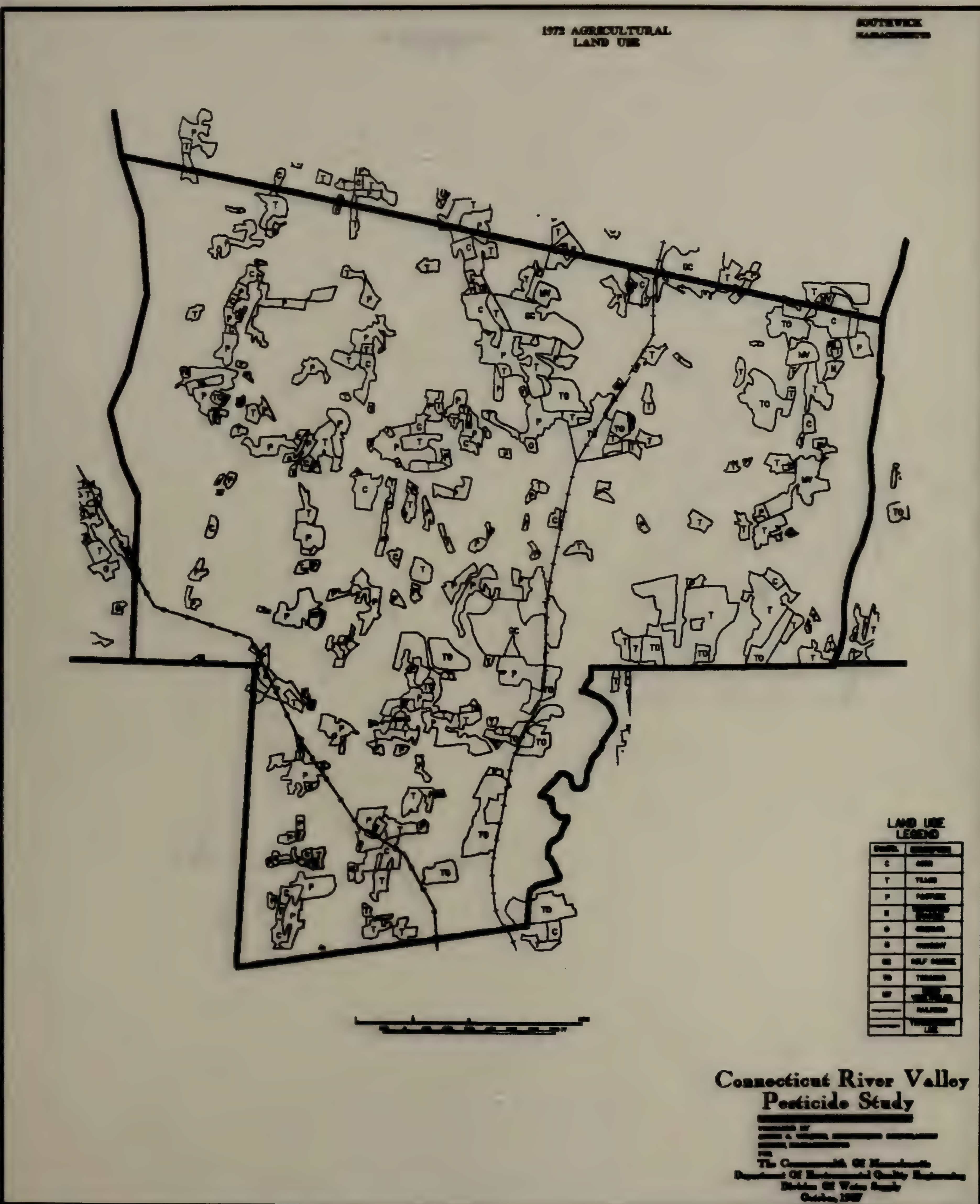
TABLE 5-17

SOUTHWICK
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
| Corn | 470 | 9 | 706 | 19 | 236 | 50 |
| Pasture | 1646 | 32 | 427 | -12 | -1719 | -74 |
| Tilled | 1617 | 32 | 693 | -19 | -924 | -57 |
| Harvested Grasses | 0 | 0 | 730 | 20 | 730 | -- |
| Tobacco | 771 | 15 | 358 | 10 | -413 | -54 |
| Orchard | 25 | <1 | 24 | -1 | -1 | -4 |
| Mixed Vegetables | 203 | 4 | 407 | 11 | 20-1 | 100 |
| Golf Course | 345 | > | 327 | 9 | -18 | -5 |
| Nursery | 12 | <1 | 0 | 0 | -12 | -100 |
| TOTAL | 5089 | 100 | 3672 | 100 | -1417 | -28 |

Area of Town 19,584

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.


1972 AGRICULTURAL
LAND USE
LAND USE
LEGEND
Connecticut River Valley
Pesticide Study

1986 AGRICULTURAL
LAND USE

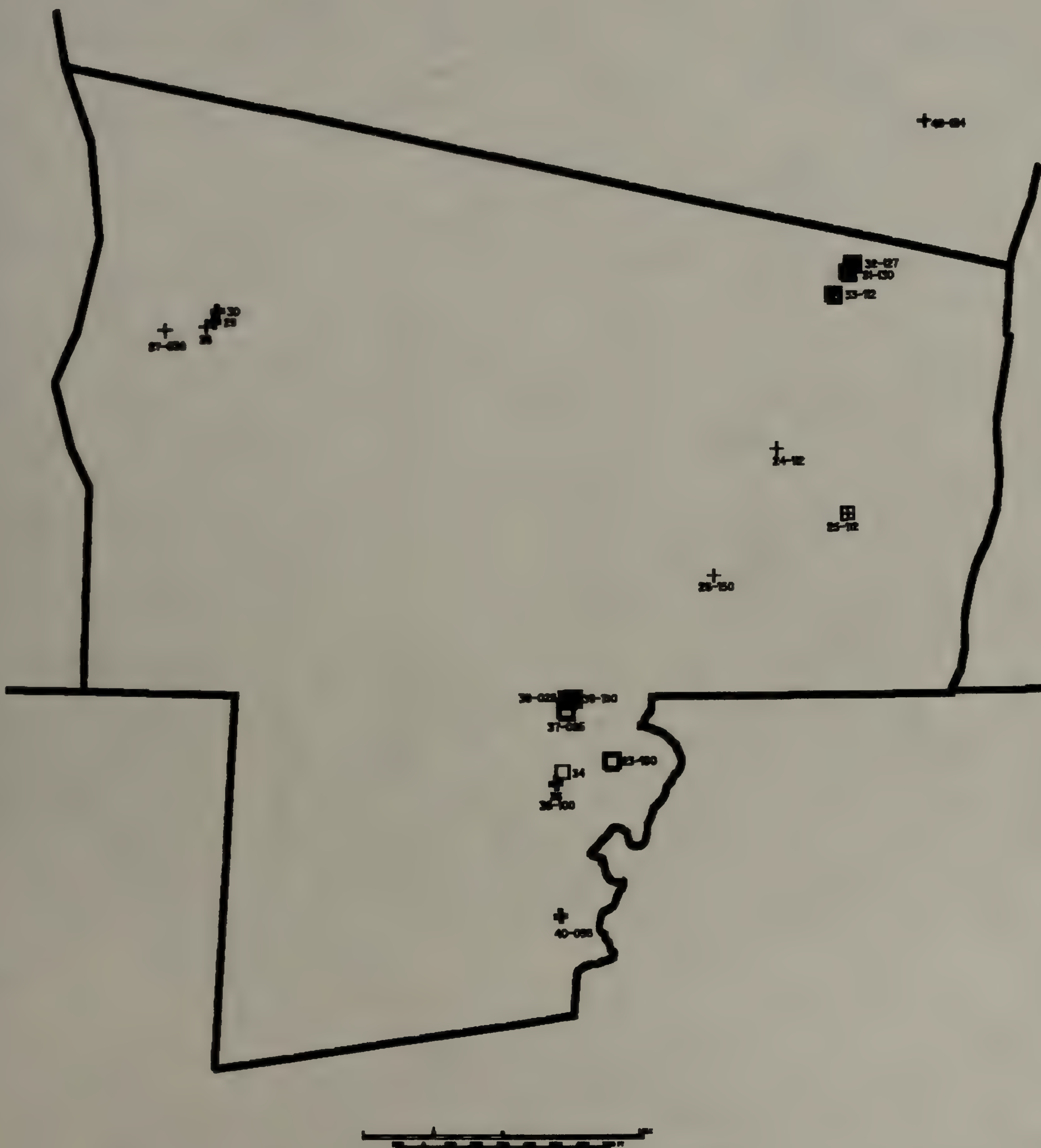
SOUTHWICK
MASSACHUSETTS


# Connecticut River Valley Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

AGRICULTURAL CHEMICALS

SOUTHWICK
MASSACHUSETTS




LEGEND-AGRICULTURAL CHEMICALS

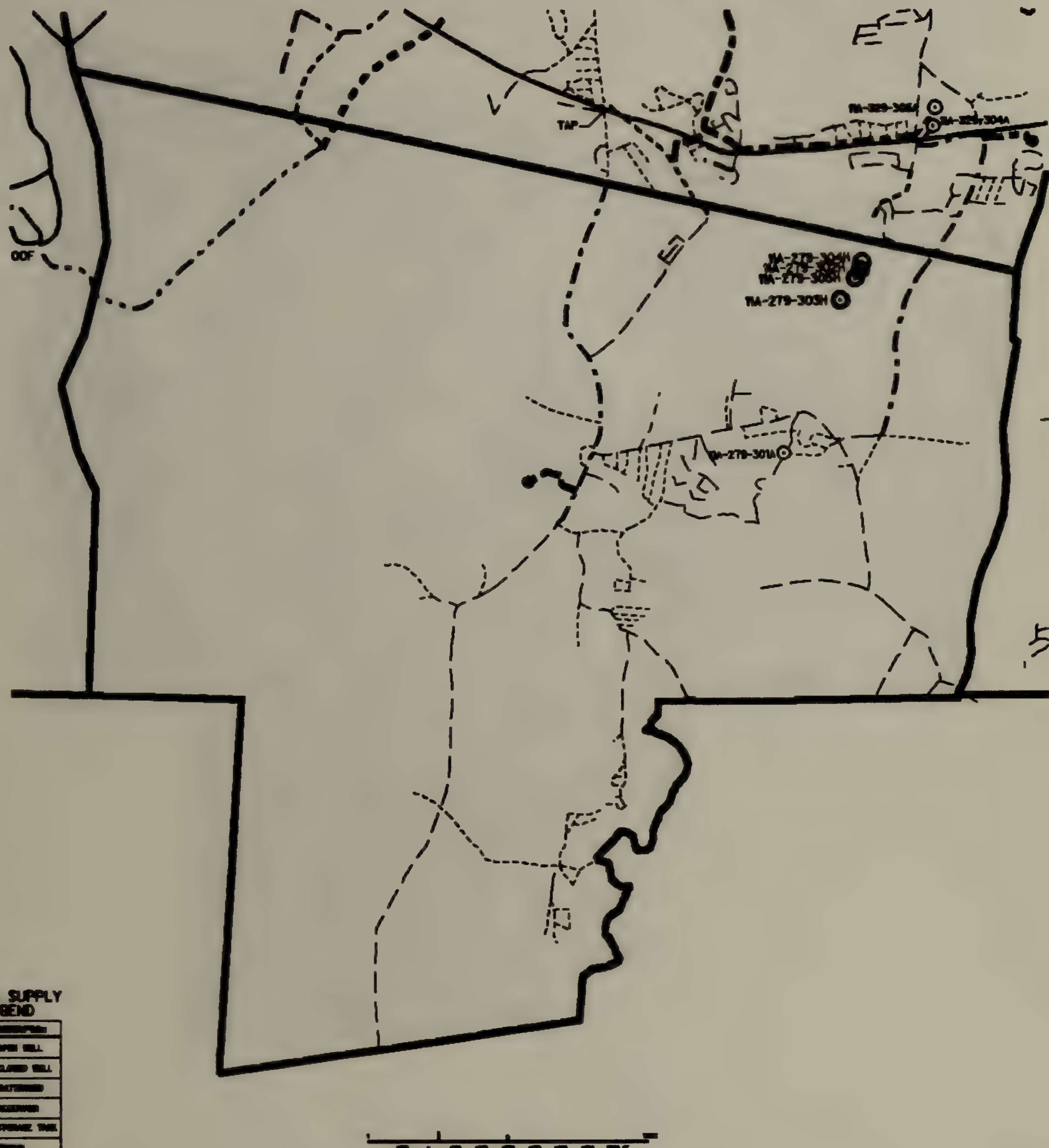
| AGRICULTURAL CHEMICALS | SYMBOL | | AGRICULTURAL CHEMICALS | SYMBOL | |
|---|---|---|---|---|---|
| | PRESENT | OVER | | PRESENT | OVER |
| ETHYLENE DIBROMIDE | □ | ■ | OXAMYL | X | X |
| ALDICARB | △ | ▲ | DINOSEB | D | D |
| ALACHLOR | ▽ | ▼ | | | |
| CARBOFURAN | ◇ | ◆ | | | |
| 1,2-DICHLOROPROPANE | + | + | | | |

# Connecticut River Valley
# Pesticide Study

PREPARED BY
[illegible]
[illegible]
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

WATER SUPPLY

SOUTHWICK




WATER SUPPLY LEGEND

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LEGEND-WATER SUPPLY PIPELINES

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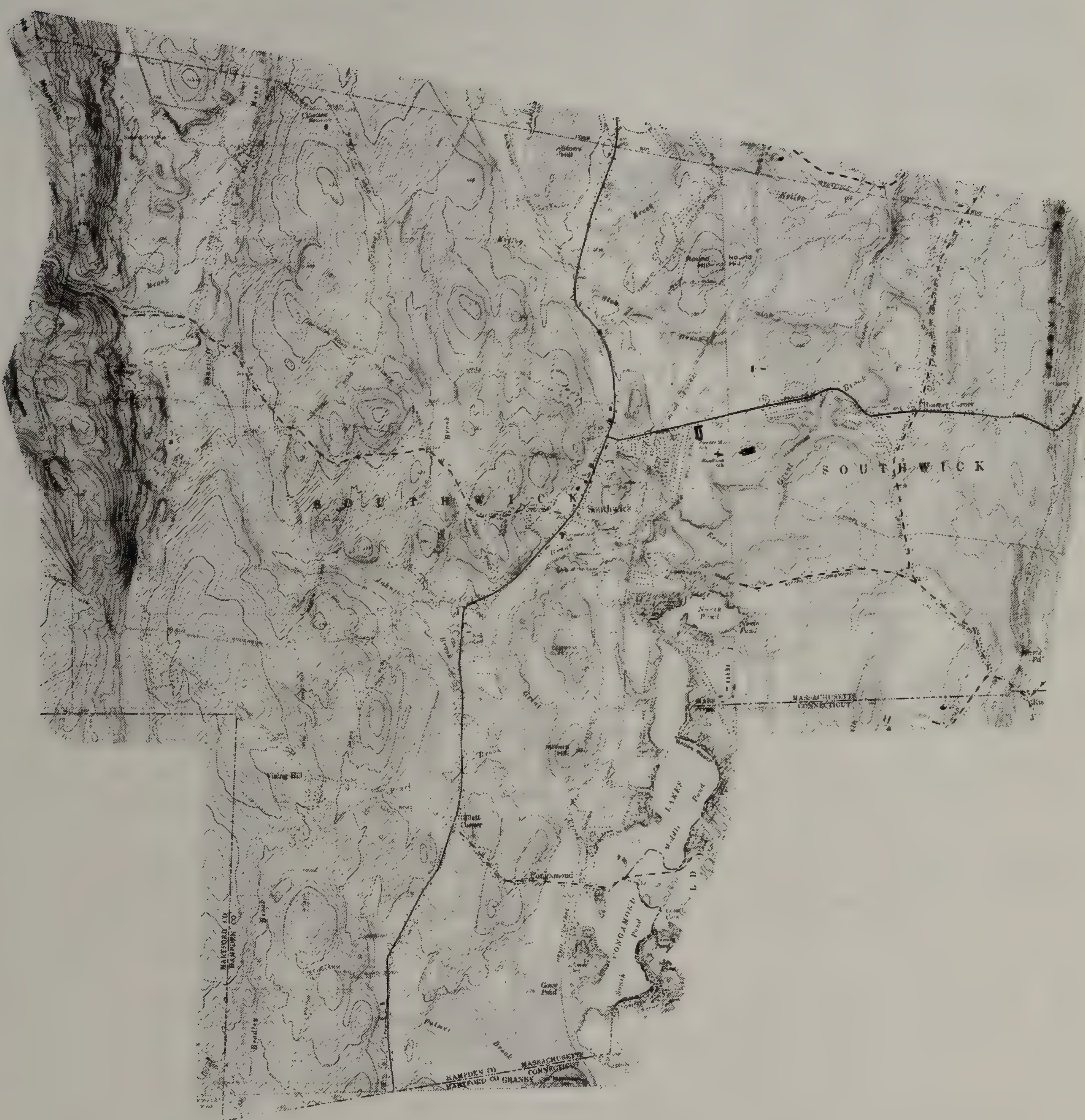
|---|---|---|---|
| 4 | | 16 | |
| 6 | | 18 | |
| 8 | | 20 | |
| 10 | | 24 | |
| 12 | | 30 | |
| 14 | | | |

# Connecticut River Valley Pesticide Study

[illegible]

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987


SOUTHWICK
Southwick
Palmer
Brook
GRANBY

## 5.18 SUNDERLAND

### 5.18.1 Agricultural Land Use

Between 1972 and 1985, the town of Sunderland saw a reduction in the area of its land committed to agricultural production of over 1469 acres or 41 percent. The largest overall changes were in land use types which were reclassified using the improved 1985 photography, such as Pasture, Tilled and Harvested Grasses. Other than reclassified areas, Corn had the largest change with an increase of 133 acres over its 1972 area. (Table 5-18 lists acreages for each of the land use classifications mapped in this study in Sunderland.)

The area committed to agriculture in Sunderland in 1972 represented 40 percent of total town land area. The major portion (55 percent) of these land use types were identified as Tilled. Considering that the photographs used in this study were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (Mixed Vegetables) without chlorophyll sensitive film.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and the lack of chlorophyll information. These included Pasture, Harvested Grasses, Tilled and Mixed Vegetables. The difficulties in separating these land use types did not lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide related land use types, Corn was the most common crop and was grown on about 16 percent of the total area committed to agriculture. Tobacco is next with 7 percent and Orchards were next with less than one percent. Nurseries and Golf Courses were not found in 1972.

By 1985, agricultural land use in the study area had shifted considerably. At that time, only 24 percent of the overall land in Sunderland remained committed to agriculture. The total area of farmland was down to 2,149 acres: a drop of 1,469 acres or 41 percent from the 1972 total.

Within Sunderland, the Tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of Till is still inflated, however, over the normal midsummer conditions because of the late September photography. The land use classifications most likely to be affected by this situation includes Corn, Harvested Grasses and Mixed Vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall and land use delineation is, however, far more accurate and precise than that made for 1972. Corn and Mixed Vegetables were the major agricultural types and represent about 33 and 27 percent, respectively, of the land area mapped in Sunderland. Harvested Grasses and Tilled were next with 15 and 13 percent, respectively. Harvested Grasses may, however,

include winter wheat due to the end of season photography date. Tobacco covered 5 percent and Orchards accounted for the remaining percentage of the land mapped in Sunderland. Nurseries and Golf Courses were not found in 1985.

5.18.2 Water Supply and Chemical Contamination

The agricultural chemical contamination overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20-town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Sunderland, 29 sites were sampled with seven sites having positive results.** Table 4-1 lists the sample locations with the sample results.

Positive results are shown on the Agricultural Chemical overlay as either a light character or a dark character depending on whether or not the concentration measured was over the Massachusetts Interim Drinking Water Guidelines (IDWG). The dark characters represent locations where the concentrations found were over the guidelines. The light characters represent locations where the concentrations were less than or equal to the IDWG **or where the concentrations were at one time over the IDWG but on subsequent sampling were found to be less than the IDWG or not detected at all.** Table 2-4 lists the IDWG for the seven agricultural chemicals. The locations with positive results are labeled with a map number and the well depth, if applicable or available. The map numbers for the locations with positive results are shown on Table 4-2.

The Water Supply overlay was developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlay shows location of groundwater and surface waters for both community and noncommunity supplies. The identification numbers used on the overlay are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlay also shows the distribution systems for the public water supplies.

Approximately 90 percent of the population in Sunderland receives their potable water from a public water supply. Sunderland has three sources of public water. The majority of public water is supplied by the Sunderland Water District, which obtains its water from three wells (one is not currently in use). Sunderland also has two sources of noncommunity public water, the Cliffside Apartments, and the Pond Ridge Condominiums which supply their facilities only. The Water District's two operating wells were tested for the seven chemicals with no contamination found.

The DEQE sampling program has sampled 29 sites in Sunderland for one or more of the seven agricultural chemicals with seven sample sites having positive results for at least one chemical. The sample locations were generally in the lowlands of Sunderland. The analyses include positive results for Ethylene Dibromide, 1,2-Dichloropropane, Aldicarb and Carbofuran. These positive results include three locations where a chemical was found one year

but not in a later year. Three of the seven sites had positive results for two chemicals. Two positive results were above the IDWG in the last sample analyzed.

Out of the 29 sample locations, 22 were sampled for Ethylene Dibromide in 1984 or 1985 with four having positive results in either 1984 or 1985. Two of these sample locations had positive results in 1984 but did not have positive results when resampled in 1985. Three of the positive results were over the IDWG limits. Ethylene Dibromide contamination was generally located on River Road near Potyrala Cross Road and near the Hadley Border.

Sixteen out of the 29 sample locations were tested for 1,2-Dichloropropane with three having positive results. Two of these positive results were over the IDWG limits. 1,2-Dichloropropane contamination was generally located on River Road near Potyrala Cross Road.

Sampling for Aldicarb occurred at 12 out of the 29 sample locations at least once between 1983 and 1986, with two sites having positive results. None of these positive results were over the IDWG limits in the latest sample. One site had a positive result in 1984 but did not in 1985. All contamination was in the southeast corner of Sunderland.

Out of the 29 sample locations, six were sampled for Carbofuran, Oxamyl, Alachlor, and Dinoseb with one site having positive results for both Carbofuran and Aldicarb. The positive results were not over the IDWG limit.

Examination of the 1972 and 1985 Agricultural Land Use overlays for the areas where contamination exists indicates that the contamination may be from nearby fields. The Land Use overlays show that in 1985 and 1972 these areas were used to grow mixed vegetables, corn, tobacco, and harvested grasses. In addition, there was a large amount of tilled fields. Table 2-3 lists the chemicals that are recommended for each crop type. Aldicarb was recommended for potatoes in 1985. Carbofuran was recommended for mixed vegetables, sweet and Indian corn, berries, and potatoes. Ethylene Dibromide was recommended for tobacco and berries in 1972 and was not recommended for any crop in 1985. 1,2-Dichloroproprane was recommended for mixed vegetables, berries, and potatoes in 1972 and mixed vegetables, tree fruit, and nursery crops in 1985. 1,2-Dichloropropane has also been used on tobacco.

A review of the public water distribution systems indicates that all of the areas with contamination are adjacent to public water.

### 5.18.3 Recommendations for Sunderland

Nearly all of the people who live in Sunderland receive their potable water from groundwater sources. The public wells tend to be upstream of the agricultural activity in Sunderland; consequently, the threat of consumption of agricultural chemical contaminated water should be small for the majority of the population.

The Sunderland Water District should continue to monitor their wells at least annually for contamination by agricultural chemicals used in the vicinity of the wells. The sampling program should be expanded in the

lowland area of Sunderland to include those chemicals recommended and/or normally used for the crops normally grown in the area of concern. From Table 2-3, the list of chemicals recommended by the New England Agricultural Extension Service for the crops grown in this area is extensive. Prior to sampling for any chemicals, surveys of chemical usage on nearby fields should be made to determine which chemicals to sample for.

Consideration should be given to connecting those households in the lowland area with private wells for potable water to the public water supply system.

TABLE 5-18

SUNDERLAND
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
| Corn | 567 | 16 | 700 | 33 | 133 | 24 |
| Pasture | 168 | 5 | 143 | 7 | -25 | 15 |
| Tilled | 1984 | 55 | 284 | 13 | -1700 | 86 |
| Harvested Grasses | 0 | 0 | 316 | 15 | 316 | - |
| Tobacco | 262 | 7 | 114 | 5 | -148 | 56 |
| Orchard | 6 | <1 | 6 | <1 | 0 | 0 |
| Mixed Vegetables | 631 | 17 | 586 | 27 | -45 | 7 |
| Golf Course | 0 | 0 | 0 | 0 | 0 | - |
| Nursery | 0 | 0 | 0 | 0 | 0 | - |
| TOTAL | 3618 | 100 | 2149 | 100 | -1469 | 41 |

Area of Town 9,088

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.

WATER SUPPLY

SUNDERLAND
MASSACHUSETTS


# Connecticut River Valley Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

AGRICULTURAL CHEMICALS

SUNDERLAND
MASSACHUSETTS


LEGEND-AGRICULTURAL CHEMICALS

| AGRICULTURAL CHEMICALS | SYMBOL | | AGRICULTURAL CHEMICALS | SYMBOL | |
|---|---|---|---|---|---|
| | PRESENT | OVER | | PRESENT | OVER |
| ETHYLENE DIBROMIDE | □ | ■ | OXAMYL | X | X |
| ALDICARB | △ | ▲ | DINOSEB | D | D |
| ALACHLOR | ▽ | ▼ | | | |
| CARBOFURAN | ◇ | ◆ | | | |
| 1,2-DICHLOROPROPANE | + | + | | | |

# Connecticut River Valley Pesticide Study

PREPARED BY
[illegible]
[illegible]
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

1985 AGRICULTURAL
LAND USE

SUNDERLAND
MASSACHUSETTS


LAND USE
LEGEND

| | |
|---|---|
| C | CORN |
| T | TILLED |
| P | PASTURE |
| H | HARVESTED GRASSES |
| O | ORCHARD |
| N | NURSERY |
| GC | GOLF COURSE |
| TO | TOBACCO |
| MV | MIXED VEGETABLES |
| | RAILROAD |
| | TRANSMISSION LINE |

# Connecticut River Valley Pesticide Study

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

1973 AGRICULTURAL
LAND USE

SUNDERLAND
MASSACHUSETTS

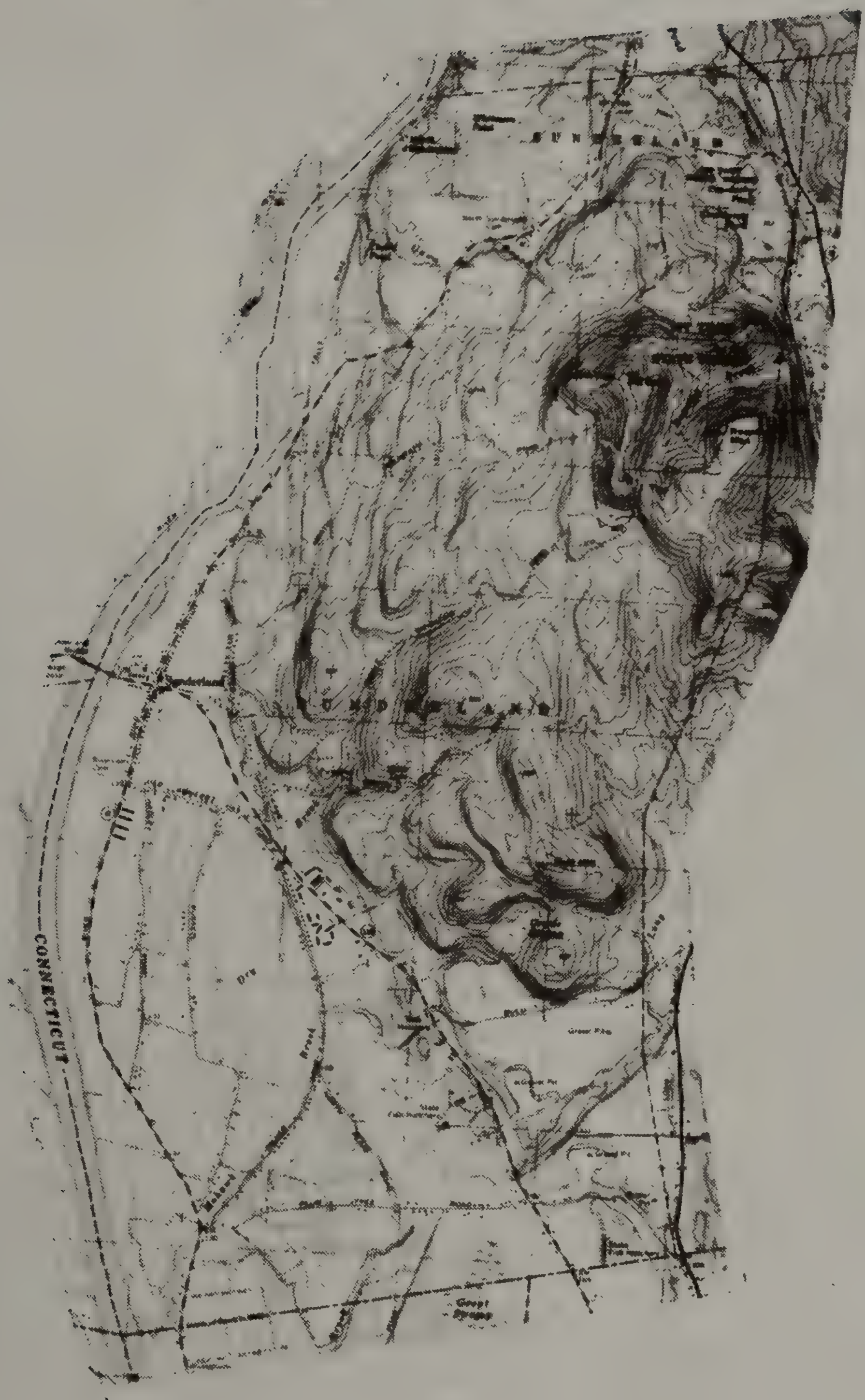
LAND USE
LEGEND

| [illegible] | [illegible] |
|---|---|
| C | CORN |
| T | TILLED |
| P | PASTURE |
| [illegible] | [illegible] |
| O | ORCHARD |
| [illegible] | [illegible] |
| GC | GOLF COURSE |
| TO | TOBACCO |
| MV | [illegible] |
|  | RAILROAD |
|  | [illegible] LINE |

# Connecticut River Valley
# Pesticide Study

[illegible]

The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987


CONNECTICUT

## 5.20 WHATELY

### 5.20.1 Agricultural Land Use

Between 1972 and 1985 the town of Whately saw a reduction of over 1,500 acres or 38 percent of the amount of land committed to agricultural production. The largest overall changes were in land use types which were reclassified using the improved 1985 photography, such as Pasture, Tilled and Harvested Grasses. Other than reclassified areas, Mixed Vegetables and Tobacco had the largest changes, having lost 530 and 440 acres, respectively, of their 1972 area. Corn gained by 56 percent, having added 285 acres. (Table 5-22 lists acreages for each of the land use classifications mapped in this study in Whately).

The area committed to agriculture in Whately in 1972 represented 18 percent of total town land area. The major portion (54 percent) of these land use types were identified as Tilled. Considering that these photographs were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (Mixed Vegetables) without chlorophyll sensitive film.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and the lack of chlorophyll information. These included Pasture, Harvested Grasses, Tilled and Mixed Vegetables. The difficulties in separating these land use types did not lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide related land use types, Tobacco was the most common crop and was grown on about 12 percent of the total area committed to agriculture. Corn is next, covering about 4 percent. Orchards accounted for area of less than 1 percent of the total. Nurseries and Golf Courses were not found in 1972.

By 1985, agricultural land use in the study area had shifted considerably. At that time only 11 percent of the overall land in Whately remained committed to agriculture. The total area of farmland was down to 2,506 acres: a drop of 1,521 acres or 38 percent from the 1972 total.

Within Whately the Tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of Till is still inflated, however, over the normal mid-summer conditions because of the late September photography. The land use classifications most likely to be affected by this situation include Corn, Harvested Grasses and Mixed Vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall and land use delineation is, however, far more accurate and precise than that made for 1972. Pasture, Harvested Grasses, Tilled, Corn and Mixed Vegetables were the major agricultural types and were fairly evenly distributed at 22, 22, 21, 19 and 15 percent, respectively, of the

## 5.19 WESTFIELD

### 5.19.1 Agricultural Land Use

Between 1972 and 1985 the town of Westfield saw a reduction in the area of its land committed to agricultural production of over 4159 acres or 77 percent. The largest overall changes were in land use types which were reclassified using the improved 1985 photography, such as pasture, tilled and harvested grasses. Other than reclassified areas, corn had the largest change with a decrease of 478 acres of its 1972 area. Table 5-19 lists acreages for each of the land use classifications mapped in this study in Westfield. The area committed to agriculture in Westfield in 1972 represented 18 percent of total town land area. The major portion (31 percent) of these land use types were identified as tilled. Considering that these photographs were taken in July, this is an unusually high percentage. This high percentage is attributed, in large part, to the low resolution of the 1972 photos, and the difficulty in distinguishing between tilled land and some young row crops (mixed vegetables) without chlorophyll sensitive film.

Four of the agricultural categories for 1972 were affected by the poor resolution of the film and the lack of chlorophyll information. These included pasture, harvested grasses, tilled and mixed vegetables. The difficulties in separating these land use types did not lead to difficulties in mapping their extent. The combined acreages associated with these categories are therefore considered to be correct.

Of the five remaining pesticide-related land use types, corn was the most common crop and was grown on about 12 percent of the total area committed to agriculture. Golf courses and tobacco are next with 5 and 4 percent, respectively. Orchards covered about one percent. Nurseries were not found in 1972.

By 1985, agricultural land use in the study area had shifted considerably. At that time only 24 percent of the overall land in Westfield remained committed to agriculture. The total area of farmland was down to 1,246 acres: a drop of 4,159 acres or 77 percent from the 1972 total.

Within Westfield the tilled category decreased considerably from the 1972 estimate. This can be attributed to the superior quality of the 1985 photographs and, consequently, the ease of delineation of all areas where vegetation had been removed. The acreage of till is still inflated, however, over the normal midsummer conditions because of the late September photography. The land use classifications most likely to be affected by this situation includes corn, harvested grasses and mixed vegetables: all groups which might be harvested and leave bare earth or dead stubble in the fields by that time of year.

The overall land use delineation is, however, far more accurate and precise than that made for 1972. Harvested grasses, tilled and tobacco were the major agricultural types and represent about 23, 18 and 16 percent, respectively, of the land area mapped in Westfield. Corn, pasture and mixed vegetables were next with 14, 11 and 10 percent, respectively. Golf courses

and orchards accounted for the remaining percentage of the land mapped in Westfield. Nurseries were not found in 1985.

5.19.2 Water Supply and Chemical Contamination

The agricultural chemical contamination overlay was developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20-town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Westfield, nine sites were sampled with two sites having positive results.** Table 4-1 lists the sample locations with the sample results.

Positive results were shown on the overlay as either a light character or a dark character depending on whether or not the concentration measured was over the Massachusetts Interim Drinking Water Guidelines (IDWG). The dark characters represent locations where the concentrations found were over the guidelines. The light characters represent locations where the concentrations were less than or equal to the IDWG **or where the concentrations were at one time over the IDWG but on subsequent sampling were found to be less than the IDWG or not detected at all.** Table 2-4 lists the IDWG for the seven agricultural chemicals. The locations with positive results are labeled with a map number and the depth, if applicable or available. The map numbers for the locations with positive results are shown on Table 4-2.

The water supply overlay was developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlay shows location of groundwater and surface waters for both community and noncommunity supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlay also shows the distribution systems for the public water supplies.

Approximately 90 percent of the population in Westfield receives their potable water from the Westfield Water Department, which obtains its water from eight wells and three reservoirs. Two of the reservoirs are located in Montgomery and the other reservoir is located in Granville. The Cobble Mountain Reservoir, located in Westfield, is part of the Springfield system. The Water Department has also located a site for construction of a ninth well for future use.

A little over half of the water supplied by the Water Department is from the wells (in 1985 about 60 percent was supplied from the wells). Westfield can also obtain water from Springfield via the Springfield Aqueduct. One source of non-community public water, the Western Massachusetts Hospital, is located in Westfield and supplies its facilities only. Six of the Water Department's wells were tested for the seven chemicals with one well having a positive result for 1,2-Dichloropropane that was less than the IDWG limit. The Hospital's well was tested for Ethylene Dibromide and 1,2-Dichloropropane with a positive result occurring for 1,2-Dichloropropane. The positive result was less than the IDWG limit.

The DEQE sampling program has sampled nine sites in Westfield (eight of the sites are public water supplies) for one or more of the seven agricultural chemicals with two public wells having positive results for 1,2-Dichloropropane.

Examination of the 1972 and 1985 Agricultural Land Use overlays for the area where agricultural chemical contamination exists indicates that the contamination may be from the nearby fields. The land use overlays show that the area near the Water Department well was used in 1985 to grow mixed vegetables and corn. In 1972, this land was used to grow some mixed vegetables. The 1972 overlay shows most of the land as Tilled. There was also a golf course located near the wells. For the Hospital well, the overlays show that in 1985 the nearby fields were used to grow mixed vegetables. In addition, the 1972 overlays indicate a large portion of tilled land. Table 2-3 lists the chemicals that were recommended by the New England Agricultural Extension Service for each crop type. 1,2-Dichloropropane was recommended for mixed vegetables, both in 1972 and 1985. 1,2-Dichloropropane was also recommended for berries and potatoes in 1972 and tree fruit and nursery crops in 1985. 1,2-Dichloropropane has also been used on tobacco.

### 5.19.3 Recommendations for Westfield

The majority of population in Westfield receives its potable water from ground water sources. Since the vast majority of residents in Westfield receive their potable water from the Westfield Water Department, the threat of consumption of agricultural chemical contaminated waters in excess of the IDWG limits is small. The Water Department should be able to monitor for and detect contamination and implement corrective measures prior to distribution.

The Westfield Water Department should continue to sample their wells at least annually for agricultural chemical contamination, since all of the wells are relatively near active farming operations and/or golf courses. The Water Department should sample the Granville Reservoir for agricultural chemicals associated with orchards since there are orchards within the reservoir's watershed.

The Water Department should consider a study as described in the beginning of Section 5 to determine the source of contamination in their well.

The sampling program should be expanded into the areas where public water is not available and active farming (as shown on the 1972 and 1985 agricultural land use overlays) is in operation, including the West and East Farms area, the Wyben area, Honey Pot Road and the Russelville Road areas.

From Table 2-3 the list of recommended chemicals for the crops is extensive. Prior to sampling for any chemicals, surveys of chemical usage on nearby fields should be made to determine which chemicals to sample for.

TABLE 4-5

PUBLIC WATER SUPPLY

| Town | Approximate Percent of Population with Public Water[1,2] | Major Source of Public Water | Any Water Supply(s) Tested for Agricultural Chemicals | Any Positive Results | Closed Supplies Due to Agricultural Chemical Contamination |
|---|---|---|---|---|---|
| Agawam | 97 | Springfield | Yes | -- | -- |
| Amherst | 99 | Surface, Ground | Yes | Yes | No |
| Belchertown | 40 | | | | |
| Belchertown Water District | | Ground | No | -- | -- |
| Belchertown State School | | Ground | No | -- | -- |
| Bernardston | 70 | Ground | Yes | No | -- |
| Deerfield | 90 | | | | |
| Deerfield Fire and Water District | | Ground | Yes | Yes | No |
| South Deerfield Water District | | Surface | Yes | Yes | Yes |
| Easthampton | 99 | Ground | Yes | Yes | No |
| Gill | 35 | Greenfield Water Department | Yes | -- | -- |
| Granby | <10 | Ground | Yes | -- | -- |
| Greenfield | 97 | Surface, Ground | Yes | No | -- |
| Hadley | >90 | Ground | Yes | No | -- |
| Hatfield | 80 | Ground, Surface | Yes | Yes | No |

(1) Massachusetts Water Resources Commission, Division of Water Resources, River Basin Planning Program, Municipal Water Resources Management Plan, Phase II Questionnaire, 1982, as updated by individual towns.

(2) Walker, E.H. and W.W. Caswell, Map Showing Availability of Ground Water in the Connecticut River Lowlands, Massachusetts, United States Geological Survey, Hydrologic Investigation Atlas, 1977.

TABLE 3-2
TOTAL AGRICULTURAL ACREAGES
1972 AND 1985

| TOWN | TOTAL ACRES | 1972 AGRICULTURAL ACRES | 1972 % OF TOWN | 1985 AGRICULTURAL ACRES | 1985 % OF TOWN | DIFFERENCE[1] (1985-1972) | % CHANGE |
|---|---|---|---|---|---|---|---|
| Agawam | 15,168 | 4,665 | 31 | 2,373 | 16 | -2,292 | -49.1 |
| Amherst | 17,600 | 6,748 | 38 | 3,062 | 17 | -3,686 | -54.6 |
| Belchertown | 33,728 | 4,721 | 14 | 2,825 | 8 | -1,896 | -40.2 |
| Bernardston | 14,976 | 2,419 | 16 | 1,732 | 12 | -687 | -28.4 |
| Deerfield | 20,416 | 6,261 | 31 | 5,286 | 26 | -975 | -15.6 |
| Easthampton | 8,576 | 2,463 | 29 | 1,553 | 18 | -910 | -36.9 |
| Gill | 9,536 | 2,830 | 30 | 1,577 | 17 | -1,253 | -44.3 |
| Granby | 17,792 | 2,622 | 15 | 2,469 | 14 | -153 | -5.8 |
| Greenfield | 14,528 | 3,144 | 22 | 1,774 | 12 | -1,370 | -43.6 |
| Hadley | 15,744 | 9,243 | 59 | 6,128 | 39 | -3,115 | -33.7 |
| Hatfield | 10,112 | 4,741 | 47 | 1,838 | 18 | -2,903 | -61.2 |
| Montague | 18,880 | 2,448 | 13 | 1,807 | 10 | -641 | -26.2 |
| Northampton | 22,144 | 4,810 | 22 | 2,380 | 11 | -2,430 | -50.5 |
| Northfield | 22,656 | 4,190 | 18 | 2,776 | 12 | -1,414 | -33.7 |
| South Hadley | 11,328 | 2,191 | 19 | 1,179 | 10 | -1,012 | -46.2 |
| Southampton | 18,496 | 3,329 | 18 | 2,403 | 13 | -926 | -27.8 |
| Southwick | 19,584 | 5,089 | 26 | 3,672 | 19 | -1,417 | -27.8 |
| Sunderland | 9,088 | 3,618 | 40 | 2,149 | 24 | -1,469 | -40.6 |
| Westfield | 29,952 | 5,405 | 18 | 1,246 | 4 | -4,159 | -76.9 |
| Whatley | 13,184 | 4,027 | 31 | 2,506 | 19 | -1,521 | -37.8 |
| TOTAL | 343,488 | 84,964 | 25 | 50,735 | 15 | -34,229 | -40.3 |

[1]Difference equals loss of agriculture land between 1972 and 1985

TABLE 3-3

LAND USE ACREAGES BY TOWN
1972

| TOWN | CORN | PASTURE | TILLED | HARVESTED GRASSES | TOBACCO | ORCHARD | MIXED VEG | GOLF COURSE | NURSERY | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| Agawam | 739 | 319 | 2,566 | 0 | 375 | 23 | 250 | 338 | 55 | 4,665 |
| Amherst | 800 | 1,953 | 3,349 | 0 | 19 | 321 | 94 | 180 | 32 | 6,748 |
| Belchertown | 348 | 1,884 | 2,052 | 0 | 0 | 215 | 5 | 33 | 184 | 4,721 |
| Bernardston | 458 | 852 | 1,091 | 0 | 0 | 8 | 0 | 0 | 10 | 2,419 |
| Deerfield | 2,085 | 626 | 3,049 | 0 | 278 | 65 | 126 | 24 | 8 | 6,261 |
| Easthampton | 904 | 324 | 1,115 | 0 | 0 | 21 | 99 | 10 | 0 | 2,463 |
| Gill | 939 | 763 | 1,052 | 0 | 0 | 8 | 8 | 54 | 6 | 2,830 |
| Granby | 331 | 489 | 1,671 | 0 | 0 | 25 | 23 | 83 | 0 | 2,622 |
| Greenfield | 392 | 587 | 1,978 | 0 | 0 | 0 | 45 | 142 | 0 | 3,144 |
| Hadley | 2,502 | 932 | 4,069 | 0 | 209 | 79 | 1,325 | 90 | 37 | 9,243 |
| Hatfield | 1,588 | 76 | 2,266 | 0 | 437 | 2 | 372 | 0 | 0 | 4,741 |
| Montague | 638 | 434 | 1,110 | 0 | 110 | 7 | 105 | 36 | 8 | 2,448 |
| Northampton | 1,623 | 385 | 1,581 | 0 | 90 | 60 | 913 | 158 | 0 | 4,810 |
| Northfield | 1,835 | 1,212 | 1,054 | 0 | 0 | 0 | 28 | 61 | 0 | 4,190 |
| South Hadley | 213 | 581 | 1,035 | 0 | 0 | 45 | 151 | 166 | 0 | 2,191 |
| Southampton | 694 | 1,147 | 1,301 | 0 | 0 | 18 | 54 | 115 | 0 | 3,329 |
| Southwick | 470 | 1,646 | 1,617 | 0 | 771 | 25 | 203 | 345 | 12 | 5,089 |
| Sunderland | 567 | 168 | 1,984 | 0 | 262 | 6 | 631 | 0 | 0 | 3,618 |
| Westfield | 655 | 1,705 | 2,304 | 0 | 217 | 48 | 196 | 280 | 0 | 5,405 |
| Whatley | 183 | 296 | 2,158 | 0 | 466 | 9 | 915 | 0 | 0 | 4,027 |
| TOTAL | 17,964 | 16,379 | 38,402 | 0 | 3,234 | 985 | 5,543 | 2,105 | 352 | 84,964 |
| % of TOTAL | 21.1 | 19.3 | 45.2 | 0.0 | 3.8 | 1.2 | 6.5 | 2.5 | 0.4 | 100.0 |

Table 3-4

CROP ACREAGES BY TOWN
1985

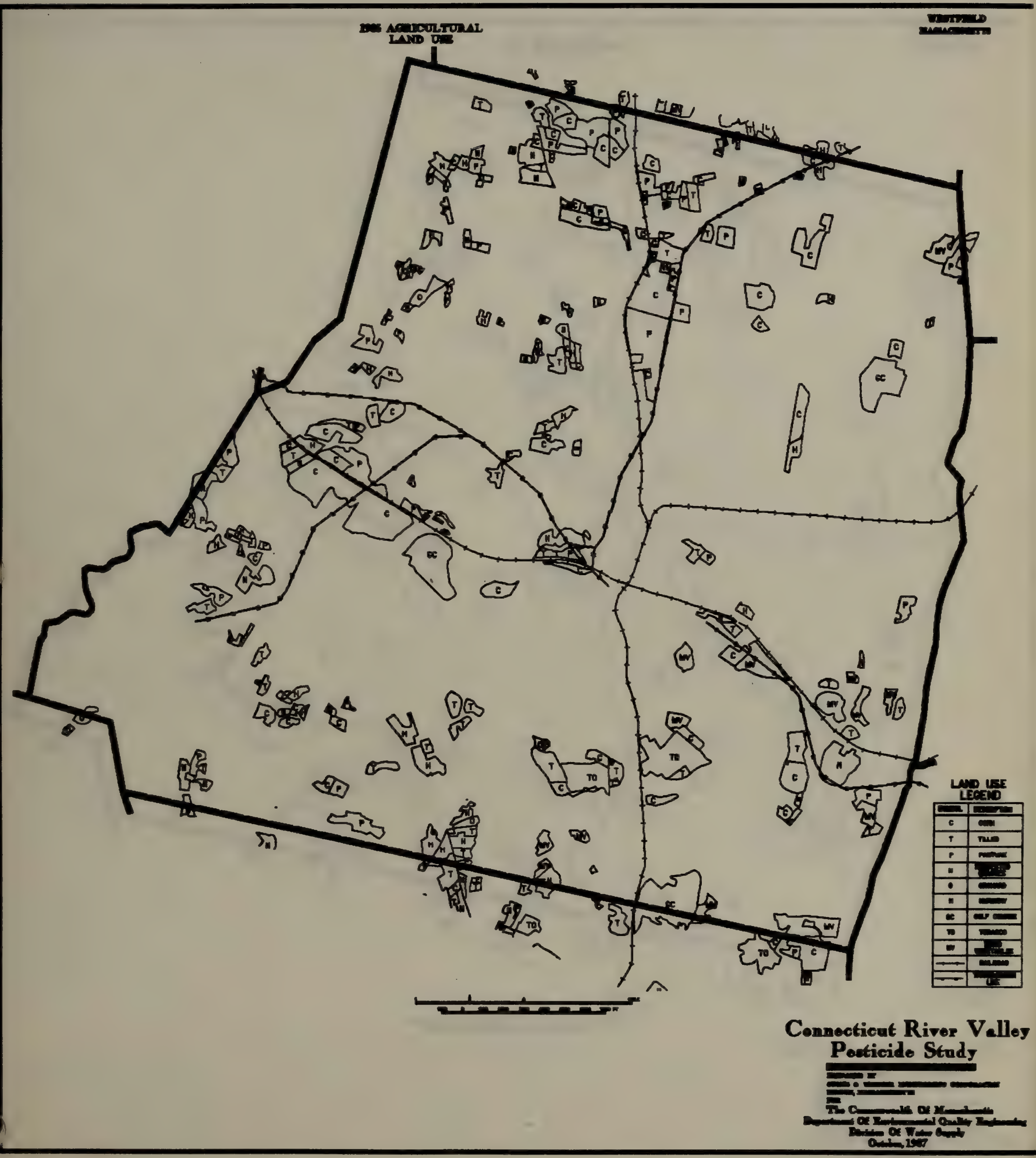
| TOWN | CORN | PASTURE | TILLED | HARVESTED GRASSES | TOBACCO | ORCHARD | MIXED VEG | GOLF COURSE | NURSERY | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| Agawam | 201 | 51 | 499 | 602 | 36 | 22 | 602 | 360 | 0 | 2,373 |
| Amherst | 358 | 667 | 40 | 1,632 | 0 | 23 | 106 | 236 | 0 | 3,062 |
| Belchertown | 103 | 571 | 453 | 1,178 | 0 | 0 | 404 | 75 | 41 | 2,825 |
| Bernardston | 174 | 703 | 112 | 634 | 0 | 0 | 21 | 88 | 0 | 1,732 |
| Deerfield | 1,790 | 435 | 739 | 1,500 | 0 | 464 | 320 | 36 | 2 | 5,286 |
| Easthampton | 517 | 283 | 206 | 321 | 0 | 125 | 16 | 0 | 85 | 1,553 |
| Gill | 530 | 504 | 69 | 403 | 0 | 8 | 16 | 47 | 0 | 1,577 |
| Granby | 181 | 594 | 223 | 1,128 | 0 | 70 | 113 | 152 | 8 | 2,469 |
| Greenfield | 510 | 299 | 44 | 669 | 0 | 10 | 89 | 153 | 0 | 1,774 |
| Hadley | 1,678 | 583 | 1,031 | 1,673 | 66 | 63 | 1,034 | 0 | 0 | 6,128 |
| Hatfield | 849 | 387 | 480 | 94 | 0 | 0 | 28 | 0 | 0 | 1,838 |
| Montague | 240 | 312 | 238 | 888 | 0 | 0 | 129 | 0 | 0 | 1,807 |
| Northampton | 723 | 290 | 683 | 419 | 0 | 32 | 117 | 116 | 0 | 2,380 |
| Northfield | 1,339 | 263 | 114 | 980 | 0 | 14 | 19 | 47 | 0 | 2,776 |
| South Hadley | 225 | 274 | 30 | 426 | 0 | 11 | 63 | 150 | 0 | 1,179 |
| Southampton | 577 | 607 | 259 | 881 | 0 | 20 | 59 | 0 | 0 | 2,403 |
| Southwick | 706 | 427 | 693 | 730 | 358 | 24 | 407 | 327 | 0 | 3,672 |
| Sunderland | 700 | 143 | 284 | 316 | 114 | 6 | 586 | 0 | 0 | 2,149 |
| Westfield | 177 | 135 | 224 | 291 | 194 | 29 | 124 | 72 | 0 | 1,246 |
| Whatley | 468 | 557 | 531 | 539 | 26 | 0 | 385 | 0 | 0 | 2,506 |
| TOTAL | 12,046 | 8,085 | 6,952 | 15,304 | 794 | 921 | 4,638 | 1,859 | 136 | 50,735 |
| % of TOTAL | 23.7 | 15.9 | 13.7 | 30.2 | 1.6 | 1.8 | 9.1 | 3.7 | 0.3 | 100.0 |
| DIFFERENCE (1985-1972) | -5,918 | -8,294 | -31,450 | 15,304 | -2,440 | -64 | -905 | -246 | -216 | -34,229 |
| % CHANGE from 1972 | -32.9 | -50.6 | -81.9 | | -75.4 | -6.5 | -16.3 | -11.7 | -61.4 | -40.3 |

Table 4-5 (Cont.)

| | | | | | |
|---|---|---|---|---|---|
| Montague | >90 | | | | |
| Lake Pleasant Water District | | Surface | No | -- | -- |
| Millers Falls F&W District | | Ground | No | -- | -- |
| Montague Center Water District | | Ground | No | -- | -- |
| Turners Falls Fire District | | Ground | Yes | Yes | No |
| Northampton | 99+ | Surface, Ground | Yes | No | -- |
| Northfield | 60 | Surface, Ground | | | |
| Northfield Water District | | Ground, Surface | No | -- | -- |
| East Northfield Water Company | | Surface | No | -- | -- |
| South Hadley | 99+ | | | | |
| South Hadley Fire District #1 | | MWRA | -- | -- | -- |
| South Hadley Fire District #2 | | Ground, Surface | Yes | No | -- |
| Southampton | 44 | Surface (Holyoke Water Works), Ground | Yes | Yes | No |
| Southwick | 50 | Ground | Yes | Yes | No* |
| Sunderland | 90 | Ground | Yes | No | -- |
| Westfield | 90 | Surface, Ground | Yes | Yes | No |
| Whately | >80 | | | | |
| Whately Water District | | Ground | Yes | No | -- |
| Whately Water Department | | Ground | No | -- | -- |

*However, four West Springfield wells in Southwick were closed for Ethylene Dibromide contamination.


LEGEND-AGRICULTURAL CHEMICALS
Connecticut River Valley
Pesticide Study


1985 AGRICULTURAL LAND USE
WESTFIELD MASSACHUSETTS
LAND USE LEGEND
GOLF COURSE
TOBACCO
Connecticut River Valley Pesticide Study
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

LAND USE
LEGEND
Connecticut River Valley
Pesticide Study


11A-329-308F
WS
TAP
11A-279-304H
11A-279-303H
WATER SUPPLY LEGEND
OPEN WELL
CLOSED WELL
RESERVOIR
STORAGE TANK
SPRING
LEGEND-WATER SUPPLY PIPELINES
Connecticut River Valley
Pesticide Study
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

TABLE 5-19

WESTFIELD
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
| Corn | 655 | 12 | 177 | 14 | -478 | -73 |
| Pasture | 1705 | 32 | 135 | 11 | -1570 | -92 |
| Tilled | 2304 | 43 | 224 | 18 | -2080 | -90 |
| Harvested Grasses | 0 | 0 | 291 | 23 | 291 | - |
| Tobacco | 217 | 4 | 194 | 16 | -23 | -11 |
| Orchard | 48 | <1 | 29 | 2 | -19 | -40 |
| Mixed Vegetables | 196 | 4 | 124 | 10 | -72 | -37 |
| Golf Course | 280 | 5 | 72 | 6 | -208 | -74 |
| Nursery | 0 | 0 | 0 | 0 | 0 | - |
| TOTAL | 5405 | 100 | 1246 | 100 | -4159 | -77 |
| Area of Town | 29,952 | | | | | |

Note: Only land use categories listed above were mapped. Urban areas, forest land, etc. were not included.

land area mapped in Whately. Harvested Grasses may, however, include winter wheat due to the end of season photography date. Tobacco covered about one percent of the mapped area and Nurseries were not represented at all.

5.20.2 Water Supply and Chemical Contamination

The agricultural chemical overlays were developed using information compiled by the Department of Environmental Quality Engineering (DEQE). The majority of samples were collected and analyzed between 1983-1986, under the direction of the DEQE and the Department of Food and Agriculture. Within the 20-town study area for this project, 358 ground and surface water sources were sampled for at least one of seven chemicals discussed in Section 2. Many of these sites were sampled more than once. A total of 146 sites had positive results for at least one chemical. **In Whately, 176 sites were sampled, with 98 sites having positive results.** Table 4-1 lists the sample locations with the sample results.

Positive results were shown on the agricultural chemical overlay as either a light character or a dark character depending on whether or not the concentration measured was over the Massachusetts Interim Drinking Water Guidelines (IDWG). The dark characters represent locations where the concentrations found were over the guidelines. The light characters represent locations where the concentrations were less than or equal to the IDWG **or where the concentrations were at one time over the IDWG but on subsequent sampling were found to be less than the IDWG or not detected at all.** Table 2-4 lists the IDWG for the seven agricultural chemicals. The locations with positive results are labeled with a map number and the well depth, if applicable or available. The map numbers for the locations with positive results are shown on Table 4-2.

The public water supply overlays were developed from information supplied by the DEQE, town engineers, water district superintendents and commissioners, and from site visits. The overlays show location of groundwater and surface waters for both community and noncommunity supplies. The identification numbers used on the overlays are DEQE numbers that can be cross-referenced with Table 4-3 to determine ownership of the supplies. The overlays also show the distribution systems for the public water supplies. The public water supply for Whately indicates that there are possible connections from Whately to South Deerfield and Hatfield.

The majority of the population in Whately receives their potable water from a public source. Whately has three sources of public water, the Whately Water District, The Whately Water Department, and the South Deerfield Water District. The Whately Water District currently obtains its water from two wells located off of Haydenville Road. The Whately Water Department obtains its supply from one well, which just recently started providing water, using grants from the DEQE and other sources. The South Deerfield Water District obtains its water from two reservoirs. The Whately Water District's water has been analyzed for all of the seven chemicals in question with no positive results.

The DEQE sampling program has sampled 176 sites in Whately for one or more of the seven agricultural chemicals with 98 sample sites having positive results for at least one chemical. Forty-two sites had positive results for

two or more chemicals. The analyses include positive results for all seven chemicals in question. These positive results include 19 locations where a chemical was found one year but not in a later year. A total of 60 positive results were above the IDWG for Ethylene Dibromide, 1,2-Dichloropropane, Aldicarb, Carbofuran, and Dinoseb. Several sample sites had more than one positive analysis for a chemical that was over the IDWG limits.

Out of the 176 sample locations, 129 were sampled for 1,2-Dichloropropane with 54 locations having positive results. 24 of these positive results were over the IDWG limits. Contamination for 1,2-Dichloropropane was generally located in four areas; Christian Lane and State Road west of Interstate 91, Longplain Road north and slightly south of Depot Road, and Depot Road east of Longplain Road, Straits Road, and a small section of River Road north of Depot Road. (See the Agricultural Chemicals overlay for more specific locations.)

Out of the 176 sample locations, 132 were sampled for Ethylene Dibromide in 1984 and 1985 with 43 sites having positive results. Nine of these sites showed contamination in 1984 but not in 1985. 18 of these positive results were over the IDWG limits in 1985. Contamination for Ethylene Dibromide was generally located in six areas; Christian Lane west of the railroad tracks, State Road just south of Christian Lane, and just north of the Interstate 91 crossover, Depot Road between Longplain and River Roads, a section of Longplain Road north of Depot Road, and two small sections of River Road.

Between 1983 and 1986, 112 locations out of the 176 sample locations were sampled for Aldicarb at least once, with 42 sites having positive results. Seven of these sites had a positive result in 1984 but not in 1985. Eleven positive results were over the IDWG limits in the latest sample. Contamination for Aldicarb was generally located in several areas; four sections of Longplain Road, three sections of River Road, two sections of Depot Road, and a portion of Straits Road.

Eighty-one of the 176 sample locations were sampled for Dinoseb, with nine having positive results. Five of the positive results showed no detectable amount after retesting. Only two of these positive results were over the IDWG limits. Contamination for Dinoseb was generally located in isolated areas in the vicinity of River Road.

Sampling was performed for Alachlor at 81 of the 176 sample locations, with only two sites having positive results. Neither of these positive results were over the IDWG limits.

Out of the 176 sample locations, 80 were sampled for Carbofuran with 14 having positive results. Only one of these positive results was over the IDWG limits. Contamination for Carbofuran was generally located along two sections of Longplain Road with isolated positive analyses on River, Depot, and Straits Roads.

Eighty of the 176 sample locations were sampled for Oxamyl with only one having a positive result, which was not over the IDWG limit.

Examination of the 1972 and 1985 Agricultural Land Use overlays for the areas where agricultural chemical contamination exists indicates that the

contamination may be from nearby fields. The Land Use overlays indicate that the land in the areas where Ethlene Dibromide and 1,2-Dichloropropane contamination has occurred generally were used in 1972 to grow tobacco. The overlays also show a large amount of tilled fields. In 1985 these lands were used for mixed vegetables and pasture land. Again, there were also tilled fields. The land in the area of Aldicarb, Dinoseb, and Carbofuran contamination was used in 1972 to grow mixed vegetables. In 1985, this land was used to grow mixed vegetables and corn.

Table 2-3 lists the chemicals that were recommended by the New England Agricultural Extension Service for each crop type. Ethylene Dibromide was recommended for tobacco and berries in 1972 and was not recommended for any crop in 1985. 1,2-Dichloropropane was recommended for mixed vegetables, berries, and potatoes in 1972 and mixed vegetables, tree fruit, and nursery crops in 1985. 1,2-Dichloropropane has also been used on tobacco. Aldicarb was recommended for potatoes in 1985. Carbofuran was recommended for mixed vegetables, sweet and indian corn, berries, and potatoes in 1985. Dinoseb was recommended for mixed vegetables, corn, forage, and potatoes in 1972 and 1985. Alachlor was recommended for corn and forage crops in 1972 and 1985. Alachlor was also recommended for nursery crops in 1985. Oxamyl was recommended for apples and tobacco in 1985.

A review of the public water distribution systems indicates that the majority of the areas with contamination presently have public water. Most of the areas were put on a public water system in 1987.

5.20.3 Recommendations for Whately

There is a large amount of agricultural chemical contamination of the aquifer in Whately. In review of the depths of the wells contaminated, the majority of contamination seems to be in the shallow aquifer. The spread of contamination is not uniform since adjacent wells with similar depths showed different levels of contamination. This could be the result of either the sampling methods/analysis or the nonuniform movement of the chemicals in the soil. Those wells that did not show contamination may in fact be contaminated. Since the contamination seems mainly to be a shallow aquifer problem, the Whately Water District wells at 350 ft deep may be safe from contamination, though contamination is possible from interaquifer leakage or from its recharge sources. Continued monitoring of these wells is warranted.

The Whately Water District and Whately Water Department should sample their wells at least annually for contamination from agricultural chemicals in the area. The sampling program should be expanded to those portions of Whately where active farming (as shown on the 1972 and 1985 agricultural land use overlays) is taking place and where there is no public water supply. These areas include North Street and upper portions of Haydenville Road.

Should contamination be found in these areas, consideration should be given to expansion of the Whately water distribution system into these areas or for North Street to tie into the South Deerfield Water District.

From Table 2-3, the list of recommended chemicals for the crops grown in Whately is extensive. Prior to sampling for any additional chemicals,

surveys of chemical usage on nearby fields should be made to determine which additional chemicals to sample for.

Since the majority of the contaminated area has recently been put on public water supply, the threat of continued contamination is small unless these contaminated wells are continued to be used for such uses as makeup to swimming pools and lawn watering.

TABLE 5-20

WHATELY
LAND USE
1972 AND 1985

| | 1972 | | 1985 | | | |
|---|---|---|---|---|---|---|
| | ACRES | % OF MAPPED AREA | ACRES | % OF MAPPED AREA | DIFFERENCE 1985-1972 | % CHANGE |
| Corn | 183 | 4 | 468 | 19 | 285 | 156 |
| Pasture | 296 | 7 | 557 | 22 | 261 | 88 |
| Tilled | 2158 | 54 | 531 | 21 | -1627 | -75 |
| Harvested Grasses | 0 | 0 | 539 | 22 | 539 | - |
| Tobacco | 466 | 12 | 26 | 1 | -440 | -94 |
| Orchard | 9 | <1 | 0 | 0 | -9 | -100 |
| Mixed Vegetables | 915 | 23 | 385 | 15 | -530 | -58 |
| Golf Course | 0 | 0 | 0 | 0 | 0 | - |
| Nursery | 0 | 0 | 0 | 0 | 0 | - |
| TOTAL | 4027 | 100 | 2506 | 100 | -1521 | -38 |

Area of Town 13,184

Note: Only the land use categories listed above were mapped. Urban areas, forest land, etc. were not included.

1972 AGRICULTURAL
LAND USE

WHATELY
MASSACHUSETTS

LAND USE
LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| C | CORN |
| T | TILLED |
| P | PASTURE |
| H | HARVESTED GRASSES |
| O | ORCHARD |
| N | NURSERY |
| GC | GOLF COURSE |
| TO | TOBACCO |
| MV | MIXED VEGETABLES |
| —+— | RAILROAD |
| —•— | TRANSMISSION LINE |

# Connecticut River Valley Pesticide Study

PREPARED BY
[illegible] CORPORATION
[illegible], MASSACHUSETTS
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987

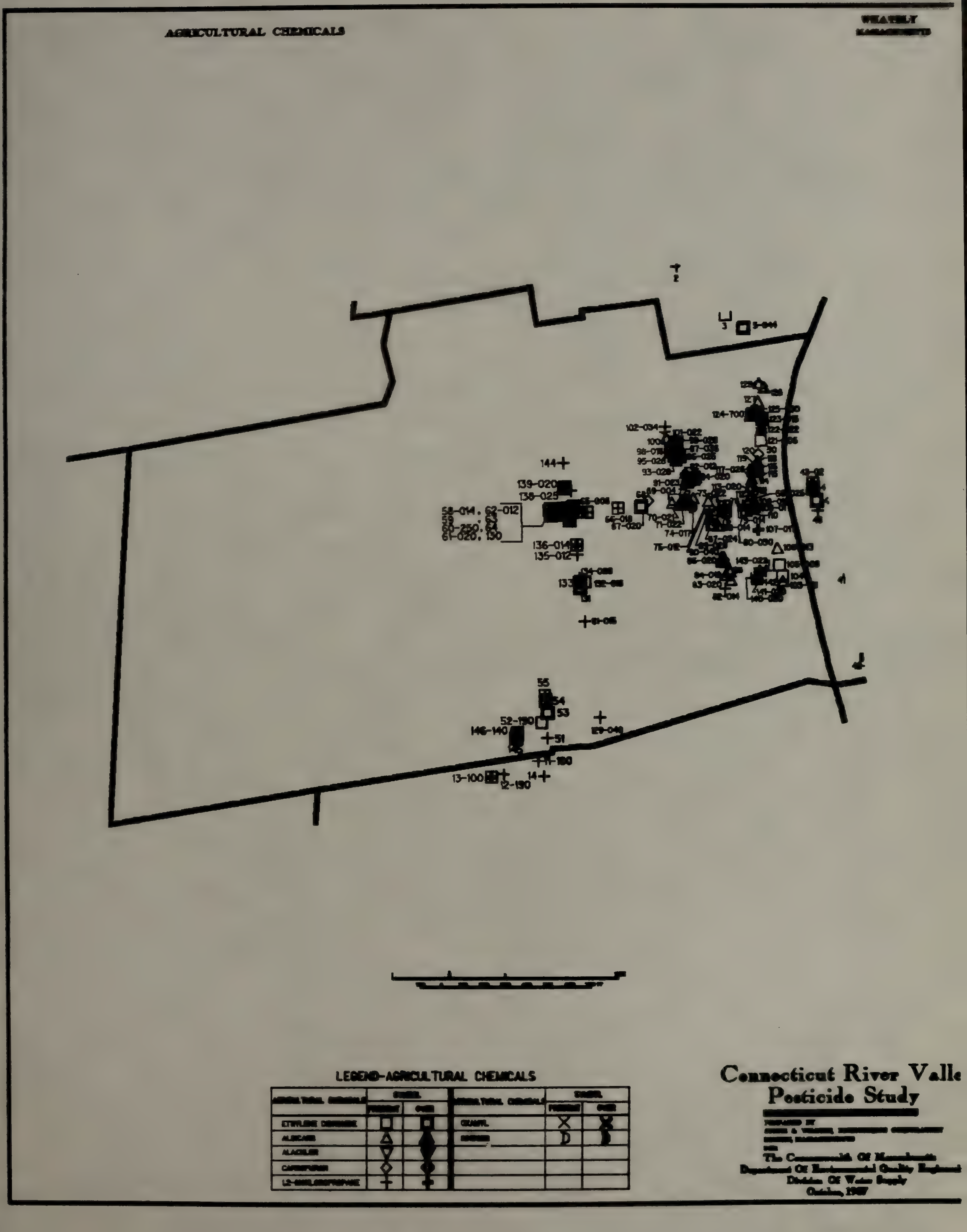
1985 AGRICULTURAL
LAND USE

LAND USE
LEGEND

| [illegible] | [illegible] |
|---|---|
| C | [illegible] |
| T | [illegible] |
| P | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| TO | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |
| [illegible] | [illegible] |

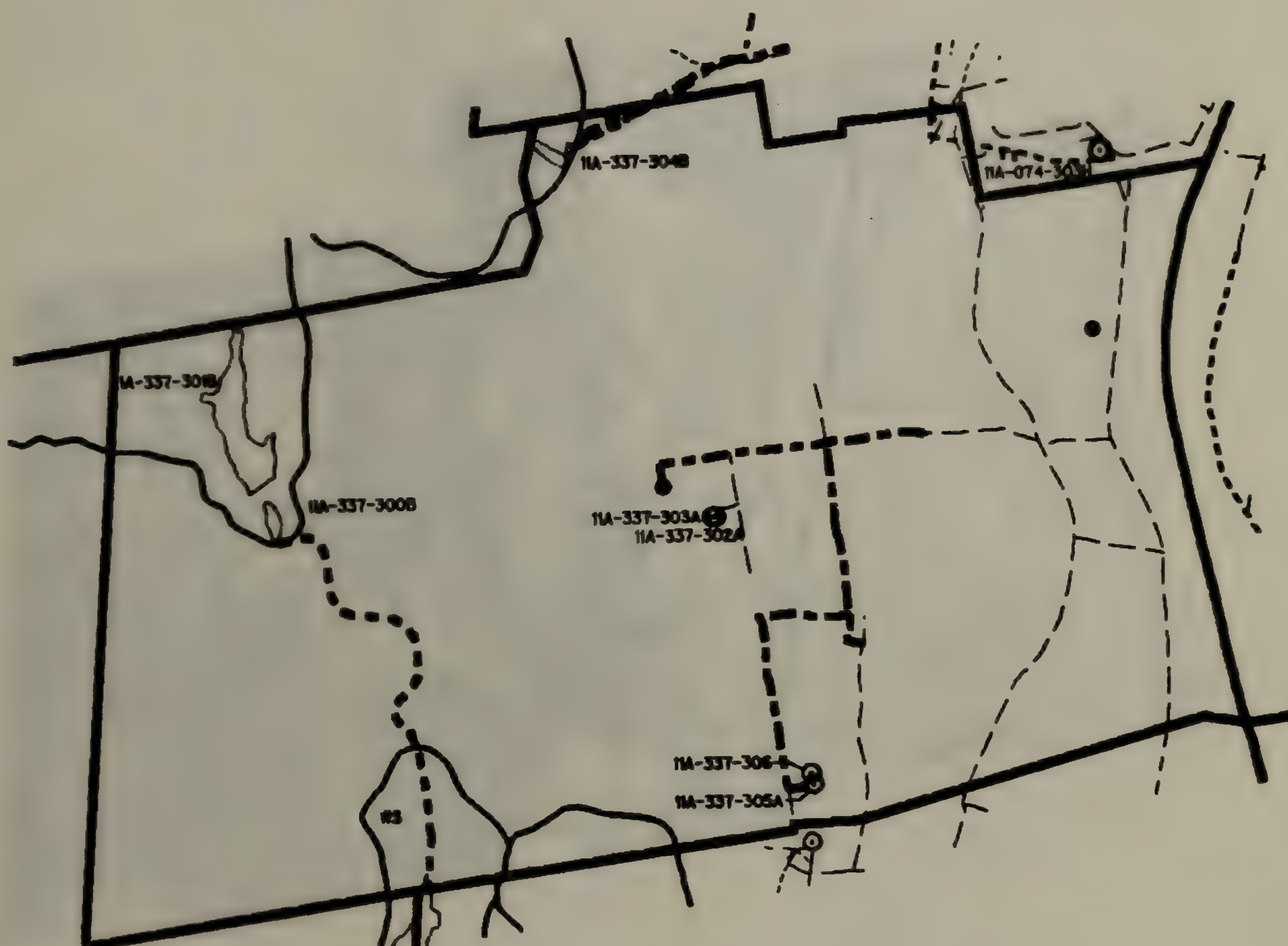
Connecticut River Valle
Pesticide Study

October, 1987


AGRICULTURAL CHEMICALS
144
139-020
138-025
102-034
124-700
136-014
135-012
52-190
146-140
129-040
13-100
12-190
14
55
54
53
51
LEGEND-AGRICULTURAL CHEMICALS
Connecticut River Valle
Pesticide Study
The Commonwealth Of Massachusetts
Division Of Water Supply

WATER SUPPLY

WHATELY
MASSACHUSETTS




WATER SUPPLY
LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| | OPEN WELL |
| | CLOSED WELL |
| | WATERSHED |
| | RESERVOIR |
| | STORAGE TANK |
| | SPRING |

LEGEND-WATER SUPPLY PIPELINES

| PIPE DIA. (IN) | SYMBOL | PIPE DIA. (IN) | SYMBOL |
|---|---|---|---|
| 4 | | 16 | |
| 6 | | 18 | |
| 8 | | 20 | |
| 10 | | 24 | |
| 12 | | 30 | |
| 14 | | | |

Connecticut River Valle
Pesticide Study

PREPARED BY
[illegible]
FOR
The Commonwealth Of Massachusetts
Department Of Environmental Quality Engineering
Division Of Water Supply
October, 1987


GREAT SWAMP
GREAT SWAMP
WHATELY
CONNECTICUT
FRANKLIN CO.
HAMPSHIRE CO.

## 6.0 References

Adie, Alan, Water Commissioner, Riverside Water District, personal communication.

Bach, George, Belchertown Water Department, personal communication.

Balk, Dorlis, Water Commissioner, Northfield Water District, personal communication.

Cody, Merlin, Water Commissioner, Lake Pleasent Water District, Montague, personal communication.

Crossland, Henry, Superintendent, South Hadley Fire District #2, personal communication.

Fleuriel, Paul, Water Commissioner, Whately Water District, Whately, personal communication.

Foley, Donald, Chief Engineer, Northfield, personal communication.

Garanin, Jim, Town Engineer, Greenfield, personal communication.

Hannley, Donald, Superintendent, Turners Falls F&W District, personal communication.

Kilmoski, Michael, Water Superintendent, Hadley Water Department, personal communication.

Kozash, Bob, Water Superintendent, Northampton Water Department, personal communciation.

Laramee, Roland, Town Engineer, Easthampton, personal communication.

Lourinitis, Fred, Water Commissioner, Sunderland Water District, personal communication.

Marshall, Harry, Water Commissioner, Bernardston F&W District, personal communication.

Massachusetts Interagency Pesticide Task Force (MIPTF), 1986a. 1985 Summary Report: Interagency Pesticide Monitoring Program. March, 1986.

Massachusetts Interagency Pesticide Task Force (MIPTF), 1986. Pesticides and Drinking Water: A public Information Package. May, 1986.

Meacham, Edith D. 1985. (Untitled). EPA Journal Vol. 11, No. 1. Page 12 January/February 1985.

Massachusetts Water Resources Commission, Division of Water Resources, River Basin Planning Program, Municipal Water Resources Management Plan, Phase II Questionnaire, 1982, as updated by individual communities.

MacConnell, W.P. and A. Mueller. 1973. Remote Sensing 20 Years of Change in Bristol County, Massachusetts, 1951-1971. Cooperative Extension Service, Univ. of Mass; and USDA, Publ. #96. 98p.

Paizick, Chester, Water Commisson Chairman, Millers Falls F&W District, personal communication.

Pelis, Bernard, Water Superintendent, Hatfield Water Department, personal communication.

Phelon, Leonard, Water Superintentdent, Westfield Water Department, personal communication.

Piechota, Fred, Bondsville F&W District, personal communication.

Savioli, John, Town Engineer, Agawam, personal communication.

Seibert, Mert, Superintendent, Southwick Water Department, personal communication.

Seidel, Henry, Holyoke Water Department, personal communication.

Slattery, Joe, Water Commission Chairman, Southampton Water Department, personal communication.

Smith, Jim, Town Engineer, Amherst, personal communication.

Suzar, John, Three Rivers F&W District, personal communication.

Szaban, Steve, Highway Superintendent, Granby, personal communication.

Szymanski, John, Water Superintendent, South Deerfield Water District, personal communication.

Thorne, John, Water Commissioner, Deerfield F&W District, personal communication.

U.S. Dept. of Commerce, Bureau of the Census (USDC), 1982 Census of Agriculture, Volume 1, Geographic Area Series, Part 21, Massachusetts (AC82-A-21), 9/84.

U.S. Dept of Commerce, Bureau of the Census (USDC), 1974 Census of Agriculture, Volume 1, Part 21, Massachusetts, 4/77.

U.S. Dept. of Commerce, Bureau of the Census (USDC), 1969 Census of Agriculture, Volume 1, Part 21, Massachusetts.

Walker, E.H. and W.W. Caswell, Map Showing Availability of Ground Water in the Connecticut River Lowlands, Massachusetts, United States Geological Survey, Hydrologic Investigation Atlas, 1977.

Waller, John, South Hadley Fire District #1, personal communication

Wansey, Lenard, Water Commission Chairman, Montague Center Water District, personal communication.

Zacek, Joe, Town Engineer, Amherst, personal communication.

# APPENDIX A

# AGRICULTURAL CHEMICALS

A.1 Alachlor

A.2 Aldicarb

A.3 Carbofuran

A.4 Dinoseb

A.5 1,2-Dichloropropane

A.6 Ethelyne Dibromide

A.7 Oxamyl

A.1 Alachlor
$C_{14}H_{20}ClNO_2$
(CAS No. 15972-60-8)

Synonyms:

2-chloro-2', 6'-diethyl-n-(methoxymethyl)-acetanilide; Alanex; Alochlor; Lasso; Metachlor; Methachlor; CP 50144; Pillarzo; Lassagrin; 2-chloro-n-(2,6-diethylphenyl)-n-(methoxymethyl)-acetamide; 2-chloro-2', 6'-diethyl-n-(methoxymethyl) acetanilide; 2-chloro-n-(2,6-diethyl) phenyl-n-methoxymethylacetamide; OHS 00506.

Background (general and regulatory):

1987 Banned from use in Massachusetts as of January 1988.
1986 After review, EPA allows continued use.
1986 Use in Massachusetts restricted as of July.
1986 EPA modifies registration classification from general use to restricted use as of July.
1984 EPA Registration Standard issued.
1983 Microencapsulated formula registered.
1969 Registered as emulsifiable concentrate.

Manufacturers:

Monsanto
Comlets Chemical Industrial Co., Ltd. (Taiwan)
Crystal Chemical Inter-America
Hightex S.A. (Spain)
Makhteshim-Agan (Israel)
Shen Hong Agricultural Chemical Co., Ltd. (Taiwan)
Shinung Corp. (Taiwan)

Use (past and present):

Preemergent application for control of selected annual grasses and broadleaf weeds.

Largest volume agricultural herbicide, with production ranging from 90-120 million lbs/year. 99 percent of use is on field corn, soybeans, and peanuts.

Recommended use in New England:

1985: field, sweet and indian corn, forage, nursey crops

1972: field corn, forage

Application rate: 1.5-3.0 quarts per acre

Behavior in the environment:

Movement: Absorbed by soil colloids. Leaches through soils; more rapidly through sandy soils than through silty clay loams.

Decomposition: Mainly by microbial action. Photodecomposition and volatilization low. Average persistence in soils is 6 to 10 weeks. Is persistent in water.

Reported occurrence:

EPA reports, based on limited monitoring, that it has been found in surface, ground, and tap water.

Found in groundwater is Massachusetts, Nebraska, Iowa, Maryland, Florida, and Ontario at levels varying from 0.01 to 16.6 ppb.

Residues found in crops.

Exposure pathway to man:

Absorption through the skin, ingestion, and inhalation.

Long- and short-term toxicity:

Possible toxic effects to liver and kidneys. Potent carcinogen.

References:

Dumanoski, Diane "Herbicide Alachlor is banned in Mass." Boston Globe. 3/11/87

HAZARDLINE Database

Anonymous, Undated. Alachlor Fact Sheet, US EPA Region I Library, 01A0004763.

Weed Science Society of America, 1983, Herbicide Handbook, Fifth Edition. Pgs 12 - 15.

Farm Chemicals Handbook '85, 1985. Meister Publ. Co. Willoughby, OH, pg. C9.

Massachusetts Interagency Pesticide Task Force, 1986. Pesticides and Drinking Water: A Public Information Package. May, 1986. 23 pgs.

Sun, M., EPA Proposal on Alachlor Nears. Science, (233):1143-1144. 1986.

Taylor, Robert E. "EPA to Allow Alachlor's Continued Use After Accelerating Review of Herbicide." Wall Street Journal. 10/3/86.

A.2 Aldicarb
$C_7H_{14}N_2O_2S$
(CAS No. 00116-06-3)

Synonyms:

Propionaldehyde, 2-Methyl-2-(Methylthio)-, O-(Methylcarbamoyl) Oxime; 2-Methyl-2-(Methyltio) Propanol, O-((Methylamino)Carbonyl) Oxime; 2-Methyl-2-(Methyltio Propionaldehyde O-(Methylcarbamoyl) Oxime; Aldecarb; Carbamic Acid, Methyl-,O-((2-Methyl-2-(Methyltio) (Propylidene) Amino) Derivative; Carbamyl; Carbanolate; ENT 27,093; NCI-C08640; OMS 771; Propanal, 2-Methyl-2-(Methylthio)-,O-((Methyamino)Carbonyl) Oxime; Propionaldehyde, 2-Methyl-2-(Methylthio)-,O-(Methylcarbamoyl) Oxime; UC 21149; Union Carbide 21149; Union Carbide UC-21149; Temik TSK; Sulfone aldoxycarb; Temic; Temik 10 G; Temik G 10; Ambush; Propanal, 2-Methyl-2-(Methylthio)-, O-((Methylamino) Carbonyl) Oxime

Background (general and regulatory):

1987 EPA proposed regulatory revision due mid-87
1985 Included on EPA "Restricted Use" list
1984 EPA special Review PD-1 issued in July
1984 EPA Registration Standard issued in March
1970 Initial registration

Manufacturer(s):

Union Carbide Agricultural Products Co., Inc.
Equitable Trading Co. (Taiwan)
Forward International Ltd. (Taiwan)

Use (past and present):

Soil incorporated insecticide, acaricide, nematicide.

Recommended use in New England:

1985: potatoes
1972: no recommendations

Application rates:

Terrestrial food use: Vegetables - 0.5 to 3.0 lb/acre
Fruits - 5.0 to 10.0 lb/acre

Terrestrial nonfood use: 5.0 to 10.0 lb/acre

Behavior in the environment:

Movement: Mobile in fine to coarse textured soils (including those with high organic contents). Low solubility in water.

Decomposition: Heat sensitive. Inherently unstable. Non-persistent with half-life less 30 days.

Reported occurrence:

Found in groundwater in Massachusetts, New York, Wisconsin, Florida, Maine, Arizona, and Virginia. Found in food.

Exposure pathway to man:

Ingestion, absorption through the skin.

Long- and short-term toxicity:

Cholinesterase inhibitor, super toxic to humans. Highly toxic to mammals, birds, estuarine/marine, and freshwater organisms. Included on EPA's list of Acutely Toxic Chemicals.

References:

HAZARDLINE Database

Anonymous, Undated, Chemical Information Fact Sheet for Aldicarb, US EPA Region I Library, 01A0004763.

EPA Chemical Profile: Aldicarb, 1985. Chemical Emergency Preparedness Program, Interim Guidance. US EPA. December 1985.

Farm Chemicals Handbook '85. Meister Publishing Co. Willoughby, OH. 1985

Massachusetts Interagency Pesticide Task Force, 1986. Pesticides and Drinking Water: A Public Information Package. May, 1986.

Rao, P.S.C., R.S. Mansell, L.B. Baldwin and M.F. Laurent. 1983. Pesticides and Their Behavior in Soil and Water. Soil Science Fact Sheet. SL40 (Revised). Florida Cooperative Extension Service. September 1983.

A.3 <u>Carbofuran</u>

$C_{12}H_{15}N_3$
(CAS No. 1563-66-2)

Synonyms:

Carbamic Acid; Methyl-,2,3-Dihydro-2, 2-Dimethyl-7-benzofuranyl Ester; 2,2-Dimethyl-2, 2-Dihydrobenzofuranyl-7 N-Methylcarbamate; 2,3-Dihydro-2, 2-Dimethyl-7-Benzofuranol-N-Methylcarbamate; Yaltox; OMS 864; 2,3-Dihydro-2, 2-Dimethylbenzofuranyl Methylcarbamate; Bay 70143; 2,3-Dihydro-2, 2-Dimethylbenzofuranyl-7-N-Methylcarbamate; 7-Benzofuranol,2, 3-Dihydro-2, 2-Dimethyl-, Methylcarbamate; Bay 70143; Chinufur; Curaterr; D 1221; ENT 27,164; FMC 10242; Furadan; Furadan 3G; Furodan; NIA 10242; Niagara 10242 Niagara Nia-10242; 7-Benzofuranol,2, 3-Dihydro-2, 2-Dimethyl-Methylcarbamate

Background (general and regulatory):

1987 Data analysis and review of Carbofuran on-going. All data must be submitted to EPA by June 1988.
1985 Included on EPA Restricted Use Pesticides list
1985 EPA initiates special review of granular formations of products containing carbofuran.
1984 Registration Standard issued by EPA.

Manufacturer(s):

FMC Agricultural Chemical Group
Brichma S.p.A. (Italy)
Crystal Chemical Inter-America
Equitable Trading Co., Ltd.
Forward International Ltd. (Taiwan)
GENP International Corp. (Taiwan)
Pillar International Co. (Taiwan)
Sun Ko Chemical Co., Ltd. (Taiwan)
Taiwan Tainan Giant Industrial Co., Ltd. (Taiwan)
Yuen Fa Chemical Co., Ltd. (Taiwan)

Use (past and present):

Insecticide, nematicide, miticide. Soil and foliar application.

1985: sweet and indian corn, peppers, potatoes, and strawberries.

1972: not recommended.

Application Rate: 1.0 to 2.0 pints per acre (corn or potatoes)
1.3 to 2.0 lbs per acre (peppers)

Behavior in the environment:

Movement: Moves in sandy soil with high percolation rate.

Decomposition: Degrades fairly slowly in nonsterile, neutral or acid aerobic soils with half-life ranging from 1 to 8 weeks. Is more stable in sterile soil and unstable under alkaline conditions.

Reported occurrence:

Found in groundwater in Wisconsin, Massachusetts, New York, and Florida.

Exposure pathway to man:

Primarily through ingestion and inhalation. Some skin absorption, but not readily.

Long- and short-term toxicity:

Extremely poisonous. Highly toxic cholinesterase inhibitor; acceptable daily intake (EPA) is 0.0050 mg/kg. Included on EPA's list of Acutely Toxic Chemicals.

References:

Anonymous. Chemical Information Fact Sheet for Carbofuran, US EPA Region I Library, 01A0004763. c. undated

EPA Chemical Profile: Carbofuran, 1985. Chemical Emergency Preparedness Program, Interim Guidance. US EPA, December 1985.

EPA Office of Pesticide Programs. Report on the Status of Chemicals in the Special Review Program, Registration Standards Program, and Data Call-in Program. March 1986.

Farm Chemicals Handbook '85. Meister Publishing Co., Willoughby, OH. 1985.

Massachusetts Interagency Pesticide Task Force. Pesticides and Drinking Water: A Public Information Package. May, 1986.

Sittig, M., Handbook of Toxic and Hazardous Chemicals. Noyes Publications, Park Ridge, N.J. 1981.

A.4 Dinoseb

$C_{10}H_{12}N_2O_5$
(CAS No. 88-85-7)

Synonyms:

2,4-Dinitro-6-(1-Methylpropyl) Phenol: 2,4-Dinitro-6-sec-Bytylphenol; 2-(1-Methylpropyl)-4,6-Dinitrophenol; Phenol, 2-sec-Buytl-4,6-Dinitro-; 4,6-Dinitro-2-(1-Methyl-n-Propyl) Phenol; 4,6 Dinitro-2-sec-Butylphenol; 4,6-Dinitro-O-sec-Butylphenol; AATOX; Aretit; Basanite; BNP20; BNP 30; Butephene; Caldon; Chemox General; Chemox PE; DBNF; Dibutox; Dinitrall; Dinitro Weed Killer; Dinitro-Ortho-Sec-Butyl Phenol; Dinitrobutylphenol; Phenol, 2-(1-Methylpropyl)-4,6-Dinitro-; DN 289; DNBP; DNOSBP; DNSBP: Dow General; Dow General Weed Killer; Dow Selective Weed Killer; Dytop; Elgetol; Elgetol 318; ENT 1,122; Gebutox; Hivertox; Kiloseb; Knoxweed; Ladob; Laseb; Nitropone; Phenol,2-(1-Methylpropyl)-4,6-Dinitro-; Sinox General; Phenol, 2-sec-Butyl-4,6-Dinitro-; Premerg; Subitex

Background (general and regulatory):

1987 Included on EPA list (Phase I) of Hazardous Constituents for Groundwater Monitoring
1986 EPA emergency suspension of use - October
1986 EPA modifies registration classification from general use to Restricted Use effective July
1986 Massachusetts restricts use as of July

Manufacturer(s):

Dow Chemical Company
Crystal Chemical Inter-America
Hoeschst AG (West Germany)
A.H. Marks & Co., Ltd. (Great Britain)
Tifta Ltd.
Uniroyal Chemical, Div. of Uniroyal, Inc.
Universal Crop Protection Ltd. (Great Britain)
Vertac Chemical Corp.

Use (past and present):

Phenol form used as general contact herbicide on orchards, vineyards, and forage legumes, and for killing potato vines and desiccating seed crops to facilitate harvest.

Ammonium salt is used as selective contact herbicide on alfalfa, clover, birdsfoot trefoil, onions, garlic, peas, and small grains.

Alkanolamine salts are used for preemergence and early postemergence treatment in numerous crops.

Triethanolamine salts are commonly applied as a dormant fruit spray for control of many insects and certain fungus diseases.

Recommended use in New England:

1985: beans, field, Indian and sweet corn, cucumbers, forage, muskmelons, peas, potatoes, squash, watermelons, pumpkins

1972: beans, sweet and field corn, cucumbers, forage, peas, potatoes, pumpkins, squash

EPA estimates that 50 percent of all potato acreage in the U.S. and over one third of the green pea crop is treated with Dinoseb annually.

Application Rates: range from 0.75 to 12 lb per acre depending on crop, weed species, and time of application.

Behavior in the environment:

Movement: Can leach in porous, sandy soils, but experiments indicate that it should not be leached from the top foot of soil by rainfall in the first year of application during which time it is subject to microbial degradation.

Decomposition: Persistent in water with half-life of 34 to 111 days.

Exposure pathway to man:

Absorption through the skin, ingestion, and inhalation.

Long- and short-term toxicity:

Exposure during application in field poses a risk of birth defects to unborn children. Potential cause of decreased fertility or sterility in males. Included on EPA's list of Acutely Toxic Chemicals.

References:

Emergency Preparedness Program, Interim Guidance. U.S. EPA, December 198.

EPA Chemical Profile: Dinoseb, 1985. Chemical Emergency Preparedness Program, Interim Guidance. U.S. EPA. 12/85.

EPA Journal, Volume 12, No. 9. November 1986.

EPA. 40 CFR Parts 264 & 270. Federal Register. Vol. 52, No. 131. 7/9/87.

Farm Chemicals Handbook '85, Meister Publishing Company, Willoughby, OH. 1985.

HAZARDLINE Database

Herbicide Handbook Committee. Herbicide Handbook, Fifth Edition. Weed Science Society of America. 1983.

Massachusetts Interagency Pesticide Task Force, 1986. Pesticides and Drinking Water: A Public Informaton Package. May, 1986.

A.5 1,2-Dichloropropane
$C_3H_4Cl_2$
(CAS No. 78-87-5)

Synonyms:

Propylene dichloride; ENT 15,406; NCI-C55141; UN 1279; Propane, 1,2-dichloro-; Propylene chloride; Alpha, beta-dichloropropane; OHS 19860; Vorlex (with 1,3-D)

Background (general and regulatory):

1987 Included on EPA list (Phase I) of Hazardous Constituents for Groundwater Monitoring
1986 EPA proposes that pharmacokinetics testing be conducted with 1,2-dichloropropane
1985 Banned from use in Massachusetts
1984 EPA proposes health and environmental effects testing
1978 EPA Interagency Testing Committee recommends 1,2-dichloropropane be further researched

Manufacturer(s):

Dow Chemical Company

Use (past and present):

Soil fumigant - nematicide

Recommended use in New England:

1985; carrots, eggplant, nursery crops, parsnips, and strawberries
1972; eggplant, potatoes, strawberries, and vegetables

Application rate: 7 to 15 gallons/acre (strawberries)
7.5 gallons/acre (nematodes in potatoes)

Other Use (nonagricultural) - solvent for manufacturing of ion exchange resins; feedstock for manufacturing of perchlorethylene; in finish and paint removers; in metal degreasing agents; as lead scavenger in fuel anti-knock fluids.

Behavior in the environment:

Movement: Moves easilty through soil

Decomposition: Very persistent in water

Classified as "Hazardous Substance," "Hazardous Waste," and "Priority Pollutant" by EPA.

Reported occurrence:

Found in groundwater in Massachusetts, New York, and California.

Exposure pathway to man:

Ingestion, absorption through skin.

Long- and short-term toxicity:

Short-term: irritant to eyes, skin, mucous membranes; possible effects on liver and kidneys.

Long-term: carcinogen in animals; probable carcinogen in humans; also shows evidence of causing genetic mutations.

<u>References:</u>

Farm Chemicals Handbook '85, 1985. Meister Publishing Company. Willoughby, OH. Page C196.

Federal Register, Volume 43, No. 210. Monday, October 30, 1978. Third Report of the Interagency Testing Committee 1,2-Dichloropropane; Proposed Test Rule. Page 50630 et sec.

Federal Register, Vol. 49, No. 4, Friday, January 6, 1984. 1,2-Dichloropropane; Proposed Test Rule. Page 899.

Federal Register, Vol. 51, No. 174, Tuesday September 9, 1986. Toxic Substances; 1,2-Dichloropropane; Testing Requirements. Page 32079: and 1,2-Dichloropropane; Proposed Test Rule; Proposed Testing Standard. Page 32107 et sec.

HAZARDLINE Database

Massachusetts Interagency Pesticide Task Force, 1986. Pesticides and Drinking Water: A Public Information Package. May, 1986.

A.6 Ethylene Dibromide

$C_2H_4Br_2$

Synonyms:

EDB; 1,2-Dibromoethane; Sym-dibromoethane; NCI-C00552; UN 1605; ENT 15,349; Glycol dibromide; Pestmaster; Ethane, 1,2-dibromo-; Bromofume; Celmide; DBE; Dobromoethane; Alpha, beta-dibromoethane; Dowfume 40; Ethylene bromide; 1,2-Ethylene dibromide; Glycol bromide; Kopfume; Soilfume; OHS09380

Background (general and regulatory)

1987 USGS begins 3-year study of subsurface movement of EDB in Florida
1984 Massachusetts sets guideline for EDB levels in public water supplies
1984 EPA recommends maximum tolerance levels in foods
1983 EPA emergency suspension of FIFRA registration of all pesticides used as fumigants containing EDB
1983 California halts use of EDB in four California counties
1982 EPA notified by State of Georgia that EDB residues were discovered in groundwater beneath agricultural land
1981 EPA issues "Notice of Proposed Rule Making" for covering the reduction of the Occupational Permissible Exposure Level for EDB in air
1980 EPA proposes cancellation of agricultural uses of EDB in all applications but soil fumigation
1977 EPA issues a Notice of Rebuttable Presumption Against Registration (RPAR)
1975 Environmental Defense Fund petitions EPA to investigate the carcinogenic potential of EDB based pesticides
1956 FDA rules EDB exempt from any special tolerance requirements
1955 Dow Chemical petitions FDA to request establishment of tolerances for inorganic bromide residues resulting from soil application of EDB as a fumigant pesticide
1948 EDB first registered for use

Manufacturer(s):

Dow Chemical
Great Lakes Chemical
Excel Industries Ltd. (India)
Inventa Corp. (India)

Use (past and present):

Fumigant, insecticide, primarily to protect against root nematodes. Also used in the processing of grain, grain-based products, and citrus fruits. In Massachusetts, used principally on tobacco crops.

Recommended use in New England:

1985: not recommended
1972: strawberries, tobacco

Application Rate: (for tobacco) 4.5 to 6.0 gallons per acre in loam or sandy soil; 9 gallons per acre in muck soil

Behavior in the environment:

Movement: Absorbed easily in organic soils and clays. Extremely mobile.

Decomposition: Persistent in acid soils with half-life of 2 months in soil (experience indicates this may be longer).

Classified as "Hazardous Substance" and "Hazardous Waste" by EPA.

Reported occurrence:

Found in groundwater in Massachusetts, Georgia, California, Hawaii, and Florida. Also found in foods (based on occurrence in grains).

Exposure pathway to man:

Ingestion, inhalation, absorption through the skin.

Long- and short-term toxicity:

Short-term - eye, skin, respiratory irritation. Chronic exposures can produce responses similar to acute poisoning.

Long-term - Listed as "potential human carcinogen" by the International Agency for Research on Cancer and as "Known to be carcinogenic" in the National Toxicology Program. Affects DNA and can cause damage to liver, kidney, spleen, cardiovascular and nervous systems.

<u>References:</u>

Farm Chemicals Handbook '85, 1985. Meister Publishing Company, Willoughby, OH, Page C100,

Federal Register, Vol. 42, No. 240, Wednesday, December 14, 1977, Part VI.I, Rebuttle Presumption Against Registration & Continued Registration of Pesticide Products Containing Ethylene Dibromide (EDB).

HAZARDLINE Database

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Volume 15. February 1977.

Massachusetts Interagency Pesticide Task Force, 1986. Pesticides and Drinking Water; A Public Information Package. May, 1986.

Pryor, Margarita, "Getting Some Good Out of EDB." EPA Journal. 12/85.

A.7 Oxamyl
$C_7H_{13}N_3O_3S$
(CAS No. 23135-22-0)

Synonyms:

Oxaminidic Acid, N', N'-Dimethyl-N-((Methylcarbamoyl) oxyl)-1 (Methylthio); 2-Dimethylamino-1-(Methylthio) Glyoxal O-Methylcarbamoylmonoxime; D-1410; DPA-1410; Insecticide-Nematicide 1410; Thioxamyl; Bydate; Methyl 2-(Dimethylamino)-N-((Methylamino) Carbonyl) Oxy)-2-Oxoethanimidothioate; S-Methyl 1-(Dimethylcarbamoyl)-N-((Methylcarbamoyl) Oxy) Thioformimidate; Methyl N', N'-Dimethyl-N-((Methylcarbamoyl) Oxy)-1-Thiooxamimidate; Vydate L Oxamyl Insecticide/Nematocide; N,N-Dimethyl-alpha-Methylcarbamoyloxyimino-alpha (Methylthio) acetamide

Background (general and regulatory):

1984 Oxamyl added to Massachusetts Restricted Use List
1982 EPA proposes limit of 2 ppm on eggplant
1981 EPA establishes tolerance for residues on root vegetables at .01 ppm

Manufacturer(s)

E.I. duPont de Nemours & Co. Inc., Agricultural Chemicals Department
Hopkins Agricultural

Use (past and present):

Control of insects, mites, and/or nematodes on many field crops, vegetables, fruits, and ornamentals.

Recommended use in New England:

1985: apples and tobacco
1972: no recommended use

Application rate: (on apples) 3 to 6 pints/300 gallon acre

Behavior in the environment:

Movement:

Decomposition: not very persistent in soil (half-life of 6 to 8 days). Relatively stable in acidic waters; sunlight, aeration and high temperatures hasten breakdown in water.

Reported occurrence:

Found in groundwater in Massachusetts, New York, and Rhode Island.

Exposure pathway to man:

Inhalation, ingestion, and absorption through skin.

Long- and short-term toxicity:

Cholinesterase inhibitor. Oral ingestion can cause death. Not known carcinogen or mutagen; however, rated as super toxic and included on EPA's list of Acutely Toxic Chemicals. Classified by the World Health Organization as "highly hazardous."

References:

EPA Chemical Profile: Oxamyl. Chemical Emergency Preparedness Program, Interim Guidance. U.S. EPA. December, 1985.

Farm Chemicals Handbook '85. Meister Publishing Company. Willoughby, Ohio. 1985.

HAZARDLINE Database

Massachusetts Interagency Pesticide Task Force, 1986. Pesticides and Drinking Water: A Public Information Package. May, 1986.

# APPENDIX B

# NEW ENGLAND PESTICIDE RECOMMENDATIONS BY CROP AND CHEMICAL

1972

TABLE B-1
NEW ENGLAND
AGRICULTURAL CHEMICAL RECOMMENDATIONS - 1972
(by Crop)

| CROP/CHEMICAL | USE |
|---|---|
| APPLE | |
| 2,4-D | herbicide |
| Niacide M | fungicide |
| Weedone 638 | herbicide |
| ammonium sulfamate | herbicide |
| azinphos-methyl | insecticide |
| binapacryl | insecticide |
| binapacryl | fungicide |
| captan | fungicide |
| carbaryl | insecticide |
| carbophenothion | insecticide |
| chlordimeform | insecticide |
| chloropropylate | insecticide |
| dalapon | herbicide |
| demeton | insecticide |
| diazinon | insecticide |
| dichlobenil | herbicide |
| dichlone | fungicide |
| dicofol | insecticide |
| dimethoate | insecticide |
| dinocap | fungicide |
| dodine | fungicide |
| endosulfan | insecticide |
| ethion | insecticide |
| ferbam | fungicide |
| folpet | fungicide |
| gliodin | fungicide |
| malathion | insecticide |
| mancozeb | fungicide |
| maneb | fungicide |
| methoxychlor | insecticide |
| mevinphos | insecticide |
| oil | insecticide |
| oxythioquinox | insecticide |
| paraquat | herbicide |
| parathion | insecticide |
| phosalone | insecticide |
| phosmet | insecticide |
| phosphamidon | insecticide |
| propargite | insecticide |
| simazine | herbicide |
| sulfur | fungicide |
| terbacil | herbicide |
| tetrachlorvinphos | insecticide |

TABLE B-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| APPLE (cont.) | |
| tetradifon | insecticide |
| tetraethyl diphosphate | insecticide |
| thiram | fungicide |
| zinc | fungicide |
| zineb | fungicide |
| ASPARAGUS | |
| 2,4-D | herbicide |
| carbaryl | insecticide |
| dalapon | herbicide |
| malathion | insecticide |
| maneb | fungicide |
| monuron | herbicide |
| rotenone | insecticide |
| simazine | herbicide |
| zinc | fungicide |
| zineb | fungicide |
| BEAN | |
| azinphos-methyl | insecticide |
| carbaryl | insecticide |
| copper | fungicide |
| dicofol | insecticide |
| dimethoate | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| dinoseb | herbicide |
| endosulfan | insecticide |
| malathion | insecticide |
| maneb | fungicide |
| methoxychlor | insecticide |
| rotenone | insecticide |
| s-ethyl dipropylthiocarbamate | herbicide |
| trifluralin | herbicide |
| BEET | |
| chloridazon | herbicide |
| copper | fungicide |
| cycloate | herbicide |
| diazinon | insecticide |
| dimethoate | insecticide |
| malathion | insecticide |
| naled | insecticide |
| zineb | fungicide |
| BLUEBERRY | |
| dichlobenil | herbicide |
| diuron | herbicide |
| simazine | herbicide |

TABLE B-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| BROCCOLI | |
| Bacillus thuringiensis | insecticide |
| captan | fungicide |
| chlordimeform | insecticide |
| chlorothalonil | fungicide |
| copper | fungicide |
| diazinon | insecticide |
| dimethoate | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| endosulfan | insecticide |
| malathion | insecticide |
| maneb | fungicide |
| methomyl | insecticide |
| naled | insecticide |
| nitrofen | herbicide |
| parathion | insecticide |
| pentachloronitrobenzene | fungicide |
| thiram | fungicide |
| trifluralin | herbicide |
| zineb | fungicide |
| CABBAGE | |
| Bacillus thuringiensis | insecticide |
| captan | fungicide |
| chlordimeform | insecticide |
| chlorothalonil | fungicide |
| copper | fungicide |
| diazinon | insecticide |
| dimethoate | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| endosulfan | insecticide |
| malathion | insecticide |
| maneb | fungicide |
| methomyl | insecticide |
| naled | insecticide |
| nitrofen | herbicide |
| parathion | insecticide |
| pentachloronitrobenzene | fungicide |
| thiram | fungicide |
| trifluralin | herbicide |
| zineb | fungicide |
| CARROT | |
| carbaryl | insecticide |
| chlorothalonil | fungicide |
| diazinon | insecticide |
| linuron | herbicide |
| malathion | insecticide |
| maneb | fungicide |

TABLE B-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| CARROT (cont.) | |
| methoxychlor | insecticide |
| mineral spirits | herbicide |
| nitrofen | herbicide |
| thiram | fungicide |
| trifluralin | herbicide |
| zinc | fungicide |
| zineb | fungicide |
| CAULIFLOWER | |
| Bacillus thuringiensis | insecticide |
| captan | fungicide |
| chlordimeform | insecticide |
| chlorothalonil | fungicide |
| copper | fungicide |
| diazinon | insecticide |
| dimethoate | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| endosulfan | insecticide |
| malathion | insecticide |
| maneb | fungicide |
| methomyl | insecticide |
| naled | insecticide |
| nitrofen | herbicide |
| parathion | insecticide |
| pentachloronitrobenzene | fungicide |
| thiram | fungicide |
| trifluralin | herbicide |
| zineb | fungicide |
| CELERY | |
| anilazine | fungicide |
| azinphos-methyl | insecticide |
| calcium chloride | fungicide |
| copper | fungicide |
| diazinon | insecticide |
| malathion | insecticide |
| maneb | fungicide |
| mineral spirits | herbicide |
| rotenone | insecticide |
| sulfallate | herbicide |
| zinc | fungicide |
| CHARD | |
| copper | fungicide |
| diazinon | insecticide |
| dimethoate | insecticide |
| malathion | insecticide |
| naled | insecticide |
| zineb | fungicide |

TABLE B-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| CORN | |
| carbaryl | insecticide |
| chlordane | insecticide |
| malathion | insecticide |
| methoxychlor | insecticide |
| tetrachlorvinphos | insecticide |
| trichlorfon | insecticide |
| CORN-FIELD | |
| 2,4-D | herbicide |
| 2,4-DB | herbicide |
| MCPA | herbicide |
| alachlor | herbicide |
| atrazine | herbicide |
| butylate | herbicide |
| chlorpropham | herbicide |
| dicamba | herbicide |
| dinoseb | herbicide |
| oil | herbicide |
| s-ethyl dipropylthiocarbamate | herbicide |
| simazine | herbicide |
| CORN-SWEET | |
| atrazine | herbicide |
| butylate | herbicide |
| dinoseb | herbicide |
| propachlor | herbicide |
| CUCUMBER | |
| bensulide | herbicide |
| captan | fungicide |
| carbaryl | insecticide |
| chlorothalonil | fungicide |
| dimethoate | insecticide |
| dinocap | fungicide |
| dinoseb | herbicide |
| endosulfan | insecticide |
| malathion | insecticide |
| maneb | fungicide |
| methoxychlor | insecticide |
| naptalam | herbicide |
| rotenone | insecticide |
| zinc | fungicide |
| zineb | fungicide |
| DILL | |
| mineral spirits | herbicide |
| EGGPLANT | |
| 1,2-dichloropropane | fungicide |

TABLE B-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| EGGPLANT (cont.) | |
| 1,3-dichloropropene | fungicide |
| carbaryl | insecticide |
| chloropicrin | fungicide |
| endosulfan | insecticide |
| malathion | insecticide |
| methoxychlor | insecticide |
| rotenone | insecticide |
| FORAGE | |
| 2,4-D | herbicide |
| 2,4-DB | herbicide |
| MCPA | herbicide |
| alachlor | herbicide |
| atrazine | herbicide |
| butylate | herbicide |
| chlorpropham | herbicide |
| dicamba | herbicide |
| dinoseb | herbicide |
| oil | herbicide |
| s-ethyl dipropylthiocarbamate | herbicide |
| simazine | herbicide |
| GRAPE | |
| dichlobenil | herbicide |
| diuron | herbicide |
| paraquat | herbicide |
| simazine | herbicide |
| LETTUCE | |
| benefin | herbicide |
| carbaryl | insecticide |
| dichloran | fungicide |
| dimethoate | insecticide |
| endosulfan | insecticide |
| malathion | insecticide |
| methoxychlor | insecticide |
| sulfallate | herbicide |
| MELON | |
| captan | fungicide |
| carbaryl | insecticide |
| chlorothalonil | fungicide |
| dimethoate | insecticide |
| dinocap | fungicide |
| endosulfan | insecticide |
| malathion | insecticide |
| maneb | fungicide |
| methoxychlor | insecticide |
| rotenone | insecticide |

TABLE B-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| MELON (cont.) | |
| zinc | fungicide |
| zineb | fungicide |
| NURSERY | |
| 1,3-dichloropropene | herbicide |
| aminotriazole | herbicide |
| amitrole | herbicide |
| ammonium thiocyanate | herbicide |
| chlorpropham | herbicide |
| dazomet | herbicide |
| dichlobenil | herbicide |
| dimethyl tetrachloroterephthalate | herbicide |
| diphenamid | herbicide |
| lindane | insecticide |
| malathion | insecticide |
| metam-sodium | herbicide |
| methyl bromide | herbicide |
| methyl isothiocyanate | herbicide |
| norea | herbicide |
| oxydemeton-methyl | insecticide |
| paraquat | herbicide |
| simazine | herbicide |
| trifluralin | herbicide |
| ONION | |
| azinphos-methyl | insecticide |
| chloroxuron | herbicide |
| diazinon | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| malathion | insecticide |
| maneb | fungicide |
| zinc | fungicide |
| zineb | fungicide |
| PARSLEY | |
| mineral spirits | herbicide |
| PARSNIP | |
| mineral spirits | herbicide |
| PEA | |
| diazinon | insecticide |
| dimethoate | insecticide |
| dinoseb | herbicide |
| malathion | insecticide |
| sulfur | fungicide |
| PEACH | |
| azinphos-methyl | insecticide |

TABLE B-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| PEACH (cont.) | |
| benomyl | fungicide |
| captan | fungicide |
| carbaryl | insecticide |
| dichlone | fungicide |
| dichloran | fungicide |
| ferbam | fungicide |
| parathion | insecticide |
| phosmet | insecticide |
| sulfur | fungicide |
| thiram | fungicide |
| PEAR | |
| 2,4-D | herbicide |
| Weedone 638* | herbicide |
| ammonium sulfamate | herbicide |
| azinphos-methyl | insecticide |
| captan | fungicide |
| carbaryl | insecticide |
| copper sulfate | fungicide |
| dalapon | herbicide |
| dichlobenil | herbicide |
| endosulfan | insecticide |
| ferbam | fungicide |
| oil | insecticide |
| paraquat | herbicide |
| parathion | insecticide |
| simazine | herbicide |
| terbacil | herbicide |
| PEPPER | |
| azinphos-methyl | insecticide |
| captan | fungicide |
| carbaryl | insecticide |
| copper | fungicide |
| copper sulfate | fungicide |
| dimethoate | insecticide |
| diphenamid | herbicide |
| endosulfan | insecticide |
| malathion | insecticide |
| maneb | fungicide |
| methoxychlor | insecticide |
| trifluralin | herbicide |
| PLUM | |
| azinphos-methyl | insecticide |
| captan | fungicide |
| carbaryl | insecticide |
| dichlone | fungicide |
| ferbam | fungicide |

TABLE B-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| PLUM (cont.) | |
| methoxychlor | insecticide |
| parathion | insecticide |
| propargite | insecticide |
| sulfur | fungicide |
| tetradifon | insecticide |
| zineb | fungicide |
| POTATO | |
| 1,2-dichloropropane | nematicide |
| 1,3-dichloropropene | nematicide |
| ammonium sulfate | fungicide |
| azinphos-methyl | insecticide |
| captafol | fungicide |
| carbaryl | insecticide |
| chlordane | insecticide |
| chlorothalonil | fungicide |
| diazinon | insecticide |
| dinoseb | herbicide |
| disulfoton | insecticide |
| endosulfan | insecticide |
| maleic hydrazide | growth reg. |
| maneb | fungicide |
| methomyl | insecticide |
| mevinphos | insecticide |
| oxydemeton-methyl | insecticide |
| parathion | insecticide |
| phorate | insecticide |
| tetraethyl diphosphate | insecticide |
| zineb | fungicide |
| PUMPKIN | |
| bensulide | herbicide |
| captan | fungicide |
| chlorothalonil | fungicide |
| dinocap | fungicide |
| dinoseb | herbicide |
| folpet | fungicide |
| maneb | fungicide |
| zineb | fungicide |
| RADISH | |
| diazinon | insecticide |
| zineb | fungicide |
| RASPBERRY | |
| dichlobenil | herbicide |
| simazine | herbicide |

TABLE B-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| SPINACH | |
| cycloate | herbicide |
| diazinon | insecticide |
| dimethoate | insecticide |
| malathion | insecticide |
| maneb | fungicide |
| naled | insecticide |
| sulfallate | herbicide |
| SQUASH | |
| bensulide | herbicide |
| captan | fungicide |
| captan | fungicide |
| carbaryl | insecticide |
| chlorothalonil | fungicide |
| copper | fungicide |
| dimethyl tetrachloroterephthalate | herbicide |
| dinocap | fungicide |
| dinoseb | herbicide |
| endosulfan | insecticide |
| folpet | fungicide |
| malathion | insecticide |
| maneb | fungicide |
| methoxychlor | insecticide |
| rotenone | insecticide |
| zineb | fungicide |
| STRAWBERRY | |
| 1,2-dichloropropane | fungicide |
| 1,3-dichloropropene | fungicide |
| captan | fungicide |
| carbaryl | insecticide |
| carbophenothon | insecticide |
| chlordane | insecticide |
| chloroxuron | herbicide |
| copper | fungicide |
| copper sulfate | fungicide |
| dichlone | fungicide |
| dicofol | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| dinocap | fungicide |
| diphenamid | herbicide |
| endosulfan | insecticide |
| ethion | insecticide |
| ethylene dibromide | fungicide |
| malathion | insecticide |
| methoxychlor | insecticide |
| thiram | fungicide |

TABLE B-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| TOBACCO | |
| 1,3-dichloropropene | fungicide |
| 1,3-dichloropropene | nematicide |
| carbaryl | insecticide |
| copper | fungicide |
| diazinon | insecticide |
| diphenamid | herbicide |
| ethylene dibromide | fungicide |
| ethylene dibromide | nematicide |
| ferbam | fungicide |
| formaldehyde | fungicide |
| malathion | insecticide |
| maneb | fungicide |
| metam-sodium | fungicide |
| metam-sodium | herbicide |
| metam-sodium | insecticide |
| metam-sodium | nematicide |
| methyl bromide | nematicide |
| methyl bromide | fungicide |
| methyl bromide | insecticide |
| methyl bromide | herbicide |
| streptomycin | fungicide |
| trichlorfon | insecticide |
| zineb | fungicide |
| TOMATO | |
| azinphos-methyl | insecticide |
| captan | fungicide |
| carbaryl | insecticide |
| copper | fungicide |
| diazinon | insecticide |
| dicofol | insecticide |
| dimethoate | insecticide |
| diphenamid | herbicide |
| endosulfan | insecticide |
| malathion | insecticide |
| maneb | fungicide |
| maneb | insecticide |
| methoxychlor | insecticide |
| tetradifon | insecticide |
| trifluralin | herbicide |
| zinc | fungicide |
| TURF GRASS | |
| 2,4-D | herbicide |
| amitrole | herbicide |
| ammonium sulfamate | herbicide |
| benefin | herbicide |
| bensulide | herbicide |
| bromoxynil | herbicide |

TABLE B-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| TURF GRASS (cont.) | |
| cacodylic acid | herbicide |
| dicamba | herbicide |
| dimethyl tetrachloroterephthalate | herbicide |
| disodium methanearsonate | herbicide |
| endothall | herbicide |
| mecaprop | herbicide |
| metam-sodium | herbicide |
| methyl bromide | herbicide |
| monoammonium methanearsonate | herbicide |
| monosodium methanearsonate | herbicide |
| paraquat | herbicide |
| phenylmercury acetate | herbicide |
| siduron | herbicide |
| silvex | herbicide |
| simazine | herbicide |
| sodium arsenate | herbicide |
| TURNIP | |
| captan | fungicide |
| chlorothalonil | fungicide |
| copper | fungicide |
| diazinon | insecticide |
| maneb | fungicide |
| pentachloronitrobenzene | fungicide |
| thiram | fungicide |
| zineb | fungicide |
| VEGETABLE | |
| 1,2-dichloropropane | fungicide |
| 1,3-dichloropropene | fungicide |
| carbaryl | insecticide |
| chlordane | insecticide* |
| diazinon | insecticide |
| formaldehyde | fungicide |
| methoxychlor | insecticide |
| methyl bromide | fungicide |
| trichlorfon | insecticide |
| XMAS TREE | |
| 2,4,5-T | herbicide |
| 2,4-D | herbicide |
| amitrole | herbicide |
| ammonium sulfamate | herbicide |
| cacodylic acid | herbicide |
| dicamba | herbicide |
| lindane | insecticide |
| malathion | insecticide |
| oxydemeton-methyl | insecticide |
| paraquat | herbicide |

TABLE B-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| XMAS TREE (cont.) | |
| picloram | herbicide |
| silvex | herbicide |
| simazine | herbicide |

*not carrots

TABLE B-2

NEW ENGLAND
AGRICULTURAL CHEMICAL RECOMMENDATIONS - 1972
(by Chemical)

| CHEMICAL | USE | CROP |
|---|---|---|
| 1,2-dichloropropane | fungicide | eggplant |
| 1,2-dichloropropane | nematicide | potato |
| 1,2-dichloropropane | fungicide | strawberry |
| 1,2-dichloropropane | fungicide | vegetable |
| 1,3-dichloropropene | fungicide | eggplant |
| 1,3-dichloropropene | herbicide | nursery |
| 1,3-dichloropropene | nematicide | potato |
| 1,3-dichloropropene | fungicide | strawberry |
| 1,3-dichloropropene | nematicide | tobacco |
| 1,3-dichloropropene | fungicide | tobacco |
| 1,3-dichloropropene | fungicide | vegetable |
| 2,4,5-T | herbicide | xmas tree |
| 2,4-D | herbicide | apple |
| 2,4-D | herbicide | asparagus |
| 2,4-D | herbicide | corn-field |
| 2,4-D | herbicide | forage |
| 2,4-D | herbicide | pear |
| 2,4-D | herbicide | turf grass |
| 2,4-D | herbicide | xmas tree |
| 2,4-DB | herbicide | corn-field |
| 2,4-DB | herbicide | forage |
| Bacillus thuringiensis | insecticide | broccoli |
| Bacillus thuringiensis | insecticide | cabbage |
| Bacillus thuringiensis | insecticide | cauliflower |
| MCPA | herbicide | corn-field |
| MCPA | herbicide | forage |
| Niacide M* | fungicide | apple |
| W75* | herbicide | nursery |
| Weedone 638* | herbicide | apple |
| Weedone 638* | herbicide | pear |
| alachlor | herbicide | corn-field |
| alachlor | herbicide | forage |
| aminotriazole | herbicide | nursery |
| amitrole | herbicide | nursery |
| amitrole | herbicide | turf grass |
| amitrole | herbicide | xmas tree |
| ammonium sulfamate | herbicide | apple |
| ammonium sulfamate | herbicide | pear |
| ammonium sulfamate | herbicide | turf grass |
| ammonium sulfamate | herbicide | xmas tree |
| ammonium sulfate | fungicide | potato |
| ammonium thiocyanate | herbicide | nursery |
| anilazine | fungicide | celery |
| atrazine | herbicide | corn-field |
| atrazine | herbicide | corn-sweet |
| atrazine | herbicide | forage |

TABLE B-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| azinphos-methyl | insecticide | apple |
| azinphos-methyl | insecticide | bean |
| azinphos-methyl | insecticide | celery |
| azinphos-methyl | insecticide | onion |
| azinphos-methyl | insecticide | peach |
| azinphos-methyl | insecticide | pear |
| azinphos-methyl | insecticide | pepper |
| azinphos-methyl | insecticide | plum |
| azinphos-methyl | insecticide | potato |
| azinphos-methyl | insecticide | tomato |
| benefin | herbicide | lettuce |
| benefin | herbicide | turf grass |
| benomyl | fungicide | peach |
| bensulide | herbicide | cucumber |
| bensulide | herbicide | pumpkin |
| bensulide | herbicide | squash |
| bensulide | herbicide | turf grass |
| binapacryl | insecticide | apple |
| binapacryl | fungicide | apple |
| bromoxynil | herbicide | turf grass |
| butylate | herbicide | corn-field |
| butylate | herbicide | corn-sweet |
| butylate | herbicide | forage |
| cacodylic acid | herbicide | turf grass |
| cacodylic acid | herbicide | xmas tree |
| calcium chloride | fungicide | celery |
| captafol | fungicide | potato |
| captan | fungicide | apple |
| captan | fungicide | broccoli |
| captan | fungicide | cabbage |
| captan | fungicide | cauliflower |
| captan | fungicide | cucumber |
| captan | fungicide | melon |
| captan | fungicide | peach |
| captan | fungicide | pear |
| captan | fungicide | pepper |
| captan | fungicide | plum |
| captan | fungicide | pumpkin |
| captan | fungicide | squash |
| captan | fungicide | squash |
| captan | fungicide | strawberry |
| captan | fungicide | tomato |
| captan | fungicide | turnip |
| carbaryl | insecticide | apple |
| carbaryl | insecticide | asparagus |
| carbaryl | insecticide | bean |
| carbaryl | insecticide | carrot |
| carbaryl | insecticide | corn |
| carbaryl | insecticide | cucumber |
| carbaryl | insecticide | eggplant |

TABLE B-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| carbaryl | insecticide | lettuce |
| carbaryl | insecticide | melon |
| carbaryl | insecticide | peach |
| carbaryl | insecticide | pear |
| carbaryl | insecticide | pepper |
| carbaryl | insecticide | plum |
| carbaryl | insecticide | potato |
| carbaryl | insecticide | squash |
| carbaryl | insecticide | strawberry |
| carbaryl | insecticide | tobacco |
| carbaryl | insecticide | tomato |
| carbaryl | insecticide | vegetable |
| carbophenothion | insecticide | apple |
| carbophenothon | insecticide | strawberry |
| chlordane | insecticide | corn |
| chlordane | insecticide | potato |
| chlordane | insecticide | strawberry |
| chlordane | insecticide | vegetable* |
| chlordimeform | insecticide | apple |
| chlordimeform | insecticide | broccoli |
| chlordimeform | insecticide | cabbage |
| chlordimeform | insecticide | cauliflower |
| chloridazon | herbicide | beet |
| chloropicrin | fungicide | eggplant |
| chloropropylate | insecticide | apple |
| chlorothalonil | fungicide | broccoli |
| chlorothalonil | fungicide | cabbage |
| chlorothalonil | fungicide | carrot |
| chlorothalonil | fungicide | cauliflower |
| chlorothalonil | fungicide | cucumber |
| chlorothalonil | fungicide | melon |
| chlorothalonil | fungicide | potato |
| chlorothalonil | fungicide | pumpkin |
| chlorothalonil | fungicide | squash |
| chlorothalonil | fungicide | turnip |
| chloroxuron | herbicide | onion |
| chloroxuron | herbicide | strawberry |
| chlorpropham | herbicide | corn-field |
| chlorpropham | herbicide | forage |
| chlorpropham | herbicide | nursery |
| copper | fungicide | bean |
| copper | fungicide | beet |
| copper | fungicide | broccoli |
| copper | fungicide | cabbage |
| copper | fungicide | cauliflower |
| copper | fungicide | celery |
| copper | fungicide | chard |
| copper | fungicide | pepper |
| copper | fungicide | squash |
| copper | fungicide | strawberry |

TABLE B-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| copper | fungicide | tobacco |
| copper | fungicide | tomato |
| copper | fungicide | turnip |
| copper sulfate | fungicide | pear |
| copper sulfate | fungicide | pepper |
| copper sulfate | fungicide | strawberry |
| cycloate | herbicide | beet |
| cycloate | herbicide | spinach |
| dalapon | herbicide | apple |
| dalapon | herbicide | asparagus |
| dalapon | herbicide | pear |
| dazomet | herbicide | nursery |
| demeton | insecticide | apple |
| diazinon | insecticide | apple |
| diazinon | insecticide | beet |
| diazinon | insecticide | broccoli |
| diazinon | insecticide | cabbage |
| diazinon | insecticide | carrot |
| diazinon | insecticide | cauliflower |
| diazinon | insecticide | celery |
| diazinon | insecticide | chard |
| diazinon | insecticide | onion |
| diazinon | insecticide | pea |
| diazinon | insecticide | potato |
| diazinon | insecticide | radish |
| diazinon | insecticide | spinach |
| diazinon | insecticide | tobacco |
| diazinon | insecticide | tomato |
| diazinon | insecticide | turnip |
| diazinon | insecticide | vegetable |
| dicamba | herbicide | corn-field |
| dicamba | herbicide | forage |
| dicamba | herbicide | turf grass |
| dicamba | herbicide | xmas tree |
| dichlobenil | herbicide | apple |
| dichlobenil | herbicide | blueberry |
| dichlobenil | herbicide | grape |
| dichlobenil | herbicide | nursery |
| dichlobenil | herbicide | pear |
| dichlobenil | herbicide | raspberry |
| dichlone | fungicide | apple |
| dichlone | fungicide | peach |
| dichlone | fungicide | plum |
| dichlone | fungicide | strawberry |
| dichloran | fungicide | lettuce |
| dichloran | fungicide | peach |
| dicofol | insecticide | apple |
| dicofol | insecticide | bean |
| dicofol | insecticide | strawberry |
| dicofol | insecticide | tomato |

TABLE B-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| dimethoate | insecticide | apple |
| dimethoate | insecticide | bean |
| dimethoate | insecticide | beet |
| dimethoate | insecticide | broccoli |
| dimethoate | insecticide | cabbage |
| dimethoate | insecticide | cauliflower |
| dimethoate | insecticide | chard |
| dimethoate | insecticide | cucumber |
| dimethoate | insecticide | lettuce |
| dimethoate | insecticide | melon |
| dimethoate | insecticide | pea |
| dimethoate | insecticide | pepper |
| dimethoate | insecticide | spinach |
| dimethoate | insecticide | tomato |
| dimethyl tetrachloroterephthalate | herbicide | bean |
| dimethyl tetrachloroterephthalate | herbicide | broccoli |
| dimethyl tetrachloroterephthalate | herbicide | cabbage |
| dimethyl tetrachloroterephthalate | herbicide | cauliflower |
| dimethyl tetrachloroterephthalate | herbicide | nursery |
| dimethyl tetrachloroterephthalate | herbicide | onion |
| dimethyl tetrachloroterephthalate | herbicide | squash |
| dimethyl tetrachloroterephthalate | herbicide | strawberry |
| dimethyl tetrachloroterephthalate | herbicide | turf grass |
| dinocap | fungicide | apple |
| dinocap | fungicide | cucumber |
| dinocap | fungicide | melon |
| dinocap | fungicide | pumpkin |
| dinocap | fungicide | squash |
| dinocap | fungicide | strawberry |
| dinoseb | herbicide | bean |
| dinoseb | herbicide | corn-field |
| dinoseb | herbicide | corn-sweet |
| dinoseb | herbicide | cucumber |
| dinoseb | herbicide | forage |
| dinoseb | herbicide | pea |
| dinoseb | herbicide | potato |
| dinoseb | herbicide | pumpkin |
| dinoseb | herbicide | squash |
| diphenamid | herbicide | nursery |
| diphenamid | herbicide | pepper |
| diphenamid | herbicide | strawberry |
| diphenamid | herbicide | tobacco |
| diphenamid | herbicide | tomato |
| disodium methanearsonate | herbicide | turf grass |
| disulfoton | insecticide | potato |
| diuron | herbicide | blueberry |
| diuron | herbicide | grape |
| dodine | fungicide | apple |
| endosulfan | insecticide | apple |
| endosulfan | insecticide | bean |

TABLE B-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| endosulfan | insecticide | cabbage |
| endosulfan | insecticide | cauliflower |
| endosulfan | insecticide | cucumber |
| endosulfan | insecticide | eggplant |
| endosulfan | insecticide | lettuce |
| endosulfan | insecticide | melon |
| endosulfan | insecticide | pear |
| endosulfan | insecticide | pepper |
| endosulfan | insecticide | potato |
| endosulfan | insecticide | squash |
| endosulfan | insecticide | strawberry |
| endosulfan | insecticide | tomato |
| endothall | herbicide | turf grass |
| ethion | insecticide | apple |
| ethion | insecticide | strawberry |
| ethylene dibromide | fungicide | strawberry |
| ethylene dibromide | fungicide | tobacco |
| ethylene dibromide | nematicide | tobacco |
| ferbam | fungicide | apple |
| ferbam | fungicide | peach |
| ferbam | fungicide | pear |
| ferbam | fungicide | plum |
| ferbam | fungicide | tobacco |
| folpet | fungicide | apple |
| folpet | fungicide | pumpkin |
| folpet | fungicide | squash |
| formaldehyde | fungicide | tobacco |
| formaldehyde | fungicide | vegetable |
| gliodin | fungicide | apple |
| lindane | insecticide | nursery |
| lindane | insecticide | xmas tree |
| linuron | herbicide | carrot |
| malathion | insecticide | apple |
| malathion | insecticide | asparagus |
| malathion | insecticide | bean |
| malathion | insecticide | beet |
| malathion | insecticide | broccoli |
| malathion | insecticide | cabbage |
| malathion | insecticide | carrot |
| malathion | insecticide | cauliflower |
| malathion | insecticide | celery |
| malathion | insecticide | chard |
| malathion | insecticide | corn |
| malathion | insecticide | cucumber |
| malathion | insecticide | eggplant |
| malathion | insecticide | lettuce |
| malathion | insecticide | melon |
| malathion | insecticide | nursery |
| malathion | insecticide | onion |
| malathion | insecticide | pea |

TABLE B-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| malathion | insecticide | pepper |
| malathion | insecticide | spinach |
| malathion | insecticide | squash |
| malathion | insecticide | strawberry |
| malathion | insecticide | tobacco |
| malathion | insecticide | tomato |
| malathion | insecticide | xmas tree |
| maleic hydrazide | growth reg. | potato |
| mancozeb | fungicide | apple |
| maneb | fungicide | apple |
| maneb | fungicide | asparagus |
| maneb | fungicide | bean |
| maneb | fungicide | broccoli |
| maneb | fungicide | cabbage |
| maneb | fungicide | carrot |
| maneb | fungicide | cauliflower |
| maneb | fungicide | celery |
| maneb | fungicide | cucumber |
| maneb | fungicide | melon |
| maneb | fungicide | onion |
| maneb | fungicide | pepper |
| maneb | fungicide | potato |
| maneb | fungicide | pumpkin |
| maneb | fungicide | spinach |
| maneb | fungicide | squash |
| maneb | fungicide | tobacco |
| maneb | insecticide | tomato |
| maneb | fungicide | tomato |
| maneb | fungicide | turnip |
| mecaprop | herbicide | turf grass |
| metam-sodium | herbicide | nursery |
| metam-sodium | herbicide | tobacco |
| metam-sodium | insecticide | tobacco |
| metam-sodium | fungicide | tobacco |
| metam-sodium | nematicide | tobacco |
| metam-sodium | herbicide | turf grass |
| methomyl | insecticide | broccoli |
| methomyl | insecticide | cabbage |
| methomyl | insecticide | cauliflower |
| methomyl | insecticide | potato |
| methoxychlor | insecticide | apple |
| methoxychlor | insecticide | bean |
| methoxychlor | insecticide | carrot |
| methoxychlor | insecticide | corn |
| methoxychlor | insecticide | cucumber |
| methoxychlor | insecticide | eggplant |
| methoxychlor | insecticide | lettuce |
| methoxychlor | insecticide | melon |
| methoxychlor | insecticide | pepper |
| methoxychlor | insecticide | plum |

TABLE B-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| methoxychlor | insecticide | squash |
| methoxychlor | insecticide | strawberry |
| methoxychlor | insecticide | tomato |
| methoxychlor | insecticide | vegetable |
| methyl bromide | herbicide | nursery |
| methyl bromide | herbicide | tobacco |
| methyl bromide | nematicide | tobacco |
| methyl bromide | fungicide | tobacco |
| methyl bromide | insecticide | tobacco |
| methyl bromide | herbicide | turf grass |
| methyl bromide | fungicide | vegetable |
| methyl isothiocyanate | herbicide | nursery |
| mevinphos | insecticide | apple |
| mevinphos | insecticide | potato |
| mineral spirits | herbicide | carrot |
| mineral spirits | herbicide | celery |
| mineral spirits | herbicide | dill |
| mineral spirits | herbicide | parsley |
| mineral spirits | herbicide | parsnip |
| monoammonium methanearsonate | herbicide | turf grass |
| monosodium methanearsonate | herbicide | turf grass |
| monuron | herbicide | asparagus |
| naled | insecticide | beet |
| naled | insecticide | broccoli |
| naled | insecticide | cabbage |
| naled | insecticide | cauliflower |
| naled | insecticide | chard |
| naled | insecticide | spinach |
| naptalam | herbicide | cucumber |
| nitrofen | herbicide | broccoli |
| nitrofen | herbicide | cabbage |
| nitrofen | herbicide | carrot |
| nitrofen | herbicide | cauliflower |
| norea | herbicide | nursery |
| oil | insecticide | apple |
| oil | herbicide | corn-field |
| oil | herbicide | forage |
| oil | insecticide | pear |
| oxydemeton-methyl | insecticide | nursery |
| oxydemeton-methyl | insecticide | potato |
| oxydemeton-methyl | insecticide | xmas tree |
| oxythioquinox | insecticide | apple |
| paraquat | herbicide | apple |
| paraquat | herbicide | grape |
| paraquat | herbicide | nursery |
| paraquat | herbicide | pear |
| paraquat | herbicide | turf grass |
| paraquat | herbicide | xmas tree |
| parathion | insecticide | apple |
| parathion | insecticide | broccoli |

TABLE B-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| parathion | insecticide | cabbage |
| parathion | insecticide | cauliflower |
| parathion | insecticide | peach |
| parathion | insecticide | pear |
| parathion | insecticide | plum |
| parathion | insecticide | potato |
| pentachloronitrobenzene | fungicide | broccoli |
| pentachloronitrobenzene | fungicide | cabbage |
| pentachloronitrobenzene | fungicide | cauliflower |
| pentachloronitrobenzene | fungicide | turnip |
| phenylmercury acetate | herbicide | turf grass |
| phorate | insecticide | potato |
| phosalone | insecticide | apple |
| phosmet | insecticide | apple |
| phosmet | insecticide | peach |
| phosphamidon | insecticide | apple |
| picloram | herbicide | xmas tree |
| propachlor | herbicide | corn-sweet |
| propargite | insecticide | apple |
| propargite | insecticide | plum |
| rotenone | insecticide | asparagus |
| rotenone | insecticide | bean |
| rotenone | insecticide | celery |
| rotenone | insecticide | cucumber |
| rotenone | insecticide | eggplant |
| rotenone | insecticide | melon |
| rotenone | insecticide | squash |
| s-ethyl dipropylthiocarbamate | herbicide | bean |
| s-ethyl dipropylthiocarbamate | herbicide | corn-field |
| s-ethyl dipropylthiocarbamate | herbicide | forage |
| siduron | herbicide | turf grass |
| silvex | herbicide | turf grass |
| silvex | herbicide | xmas tree |
| simazine | herbicide | apple |
| simazine | herbicide | asparagus |
| simazine | herbicide | blueberry |
| simazine | herbicide | corn-field |
| simazine | herbicide | forage |
| simazine | herbicide | grape |
| simazine | herbicide | nursery |
| simazine | herbicide | pear |
| simazine | herbicide | raspberry |
| simazine | herbicide | turf grass |
| simazine | herbicide | xmas tree |
| sodium arsenate | herbicide | turf grass |
| streptomycin | fungicide | tobacco |
| sulfallate | herbicide | celery |
| sulfallate | herbicide | lettuce |
| sulfallate | herbicide | spinach |
| sulfur | fungicide | apple |

TABLE B-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| sulfur | fungicide | pea |
| sulfur | fungicide | peach |
| sulfur | fungicide | plum |
| terbacil | herbicide | apple |
| terbacil | herbicide | pear |
| tetrachlorvinphos | insecticide | apple |
| tetrachlorvinphos | insecticide | corn |
| tetradifon | insecticide | apple |
| tetradifon | insecticide | plum |
| tetradifon | insecticide | tomato |
| tetraethyl diphosphate | insecticide | apple |
| tetraethyl diphosphate | insecticide | potato |
| thiram | fungicide | apple |
| thiram | fungicide | broccoli |
| thiram | fungicide | cabbage |
| thiram | fungicide | carrot |
| thiram | fungicide | cauliflower |
| thiram | fungicide | peach |
| thiram | fungicide | strawberry |
| thiram | fungicide | turnip |
| trichlorfon | insecticide | corn |
| trichlorfon | insecticide | tobacco |
| trichlorfon | insecticide | vegetable |
| trifluralin | herbicide | bean |
| trifluralin | herbicide | broccoli |
| trifluralin | herbicide | cabbage |
| trifluralin | herbicide | carrot |
| trifluralin | herbicide | cauliflower |
| trifluralin | herbicide | nursery |
| trifluralin | herbicide | pepper |
| trifluralin | herbicide | tomato |
| zinc | fungicide | apple |
| zinc | fungicide | asparagus |
| zinc | fungicide | carrot |
| zinc | fungicide | celery |
| zinc | fungicide | cucumber |
| zinc | fungicide | melon |
| zinc | fungicide | onion |
| zinc | fungicide | tomato |
| zineb | fungicide | apple |
| zineb | fungicide | asparagus |
| zineb | fungicide | beet |
| zineb | fungicide | broccoli |
| zineb | fungicide | cabbage |
| zineb | fungicide | carrot |
| zineb | fungicide | cauliflower |
| zineb | fungicide | chard |
| zineb | fungicide | cucumber |
| zineb | fungicide | melon |
| zineb | fungicide | onion |

TABLE B-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| zineb | fungicide | plum |
| zineb | fungicide | potato |
| zineb | fungicide | pumpkin |
| zineb | fungicide | radish |
| zineb | fungicide | squash |
| zineb | fungicide | tobacco |
| zineb | fungicide | turnip |

*Trade Name
**not carrots

APPENDIX B

REFERENCES


Emergency Preparedness Program, Interim Guidance. U.S. EPA, December 1985.

Massachusetts and Connecticut Agricultural Experiment Stations and Extension Services. 1972 Pest Control Chart for Tobacco Fields. Cooperative Extension Service. 1972.

Massachusetts and Connecticut Agricultural Experiment Stations and Extension Services. 1972 Tobacco Seedbed Management and Pest Control. Cooperative Extension Service. 1972.

Savos, M.G., and D.B. Schroeder. 1972 Connecticut Vegetable Insect and Disease Control Guide for Commercial Growers for Field Grown Crops Only. Cooperative Extension Service, College of Agricultural and Natural Resources, University of Connecticut. 72-38. 1972.

Savos, M.G., D.B. Schroeder, R.C. Moore, C.J. Gilgut and G.L. Jensen. Peaches 1972. A Pest Control Guide for Commercial Growers in Massachusetts. Cooperative Extension Service. 1972.

Savos, M.G., D.B. Schroeder, R.C. Moore, C.J. Gilgut and G.L. Jensen. Pears 1972. A Pest Control Guide for Commercial Growers in Massachusetts. Cooperative Extension Service. 1972.

Savos, M.G. D.B. Schroeder, R.C. Moore, C.J. Gilgut and G.L. Jensen. Plums 1972. A Pest Control Guide for Commercial Growers in Massachusetts. Cooperative Extension Service. 1972.

State Weed Control Specialists of New England. Control of Weeds in Nursery Crops. Cooperative Extension Service. 1973.

State Weed Control Specialists of New England. 1972 New England Chemical Weed Control for Corn and Forage Crops. Cooperative Extension Service. 1972.

State Weed Control Specialists of New England. 1972 New England Chemical Weed Control for Tree Fruits (Commercial Production Only). Cooperative Extension Service. 1972.

State Weed Control Specialists of New England. 1972 New England Chemical Weed Control Recommendations for Vegetables. Agricultural Extension Service. 72-6. 1972.

Williams, Charles, et al. 1972 New England Brush Control in Nonfood Crop Areas and Weed and Brush Control in Christmas Tree Stands. Cooperative Extension Service. 1972.

APPENDIX C

APPENDIX C

# NEW ENGLAND PESTICIDE RECOMMENDATIONS BY CROP AND CHEMICAL

1985

TABLE C-1
NEW ENGLAND
AGRICULTURAL CHEMICAL RECOMMENDATIONS - 1985
(By Crop)

| CROP/CHEMICAL | USE |
|---|---|
| APPLE | |
| 2,2, dimethylhydrazide | growth reg. |
| 2,4-D | herbicide |
| 6-benzyl adenine | growth reg. |
| ammonium sulfamate | herbicide |
| azinphos-methyl | insecticide |
| benomyl | fungicide |
| captafol | fungicide |
| captan | fungicide |
| carbaryl | insecticide |
| chlorpyrifos | insecticide |
| cyhexatin | insecticide |
| dalapon | herbicide |
| demeton | insecticide |
| diazinon | insecticide |
| dichlobenil | herbicide |
| dichlone | fungicide |
| dicofol | insecticide |
| dimethoate | insecticide |
| dinocap | insecticide |
| dinocap | fungicide |
| disulfoton | insecticide |
| diuron | herbicide |
| endosulfan | insecticide |
| ethephon | growth reg. |
| ethion | insecticide |
| fenvalerate | insecticide |
| ferbam | fungicide |
| flucythrinate | insecticide |
| formetanate HCL | insecticide |
| gibberellins | growth reg. |
| glyodin | fungicide |
| malathion | insecticide |
| maneb | fungicide |
| maneb | fungicide |
| manganese | fungicide |
| metalaxyl | fungicide |
| methomyl | insecticide |
| methoxychlor | insecticide |
| methyl parathion | insecticide |
| metiram | fungicide |
| naphthalene acetamide | growth reg. |
| naphthaleneacetic acid | growth reg. |
| napropamide | herbicide |
| organotin | insecticide |
| oryzalin | herbicide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| oxamyl | insecticide |
| paraquat | herbicide |
| permethrin | insecticide |
| phosalone | insecticide |
| phosmet | insecticide |
| phosphamidon | insecticide |
| propargite | insecticide |
| simazine | herbicide |
| succinic acid | growth reg. |
| sulfur | fungicide |
| terbacil | herbicide |
| thiophanate-methyl | fungicide |
| thiram | fungicide |
| triadimefon | fungicide |
| triforine | fungicide |
| zinc | fungicide |
| ASPARAGUS | |
| carbaryl | insecticide |
| dalapon | herbicide |
| diazinon | insecticide |
| diuron | herbicide |
| glyphosate | herbicide |
| malathion | insecticide |
| mancozeb | fungicide |
| methomyl | insecticide |
| methoxychlor | insecticide |
| metribuzin | herbicide |
| napropamide | herbicide |
| rotenone | insecticide |
| simazine | herbicide |
| BEANS | |
| acephate | insecticide |
| azinphos-methyl | insecticide |
| benomyl | fungicide |
| bentazon | herbicide |
| carbaryl | insecticide |
| copper sulfate | fungicide |
| cupric hydroxide | bacteriacide |
| demeton | insecticide |
| dichloran | fungicide |
| dicofol | insecticide |
| dimethoate | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| dinoseb | herbicide |
| fenvalerate | insecticide |
| glyphosate | herbicide |
| malathion | insecticide |
| maneb | fungicide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| BEANS (cont.) | |
| methomyl | insecticide |
| methyl parathion | insecticide |
| metolachlor | herbicide |
| s-ethyldipropylthiocarbamate | herbicide |
| thiophanate-methyl | fungicide |
| thiram | fungicide |
| trichlorfon | insecticide |
| trifluralin | herbicide |
| zineb | fungicide |
| BEETS | |
| copper sulfate | fungicide |
| cycloate | herbicide |
| diazinon | insecticide |
| glyphosate | herbicide |
| malathion | insecticide |
| parathion | insecticide |
| phenmedipham | herbicide |
| pyrazon | herbicide |
| thiram | fungicide |
| BLUEBERRY | |
| azinphos-methyl | insecticide |
| benomyl | fungicide |
| captafol | fungicide |
| captan | fungicide |
| carbaryl | insecticide |
| dichlobenil | herbicide |
| diuron | herbicide |
| folpet | fungicide |
| malathion | insecticide |
| napropamide | herbicide |
| oil | insecticide |
| paraquat | herbicide |
| parathion | insecticide |
| phosmet | insecticide |
| simazine | herbicide |
| sulfur | fungicide |
| terbacil | herbicide |
| triforine | fungicide |
| BROCCOLI | |
| Bacillus thuringiensis | insecticide |
| azinphos-methyl | insecticide |
| carbaryl | insecticide |
| chlorothalonil | fungicide |
| chlorpyrifos | insecticide |
| cupric hydroxide | fungicide |
| diazinon | insecticide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| BROCCOLI (cont.) | |
| dimethoate | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| endosulfan | insecticide |
| fenvalerate | insecticide |
| fonofos | insecticide |
| glyphosate | herbicide |
| maneb | fungicide |
| methamidophos | insecticide |
| methomyl | insecticide |
| oxydemeton-methyl | insecticide |
| pentachloronitrobenzene | fungicide |
| permethrin | insecticide |
| thiram | fungicide |
| trifluralin | herbicide |
| CABBAGE | |
| Bacillus thuringiensis | insecticide |
| azinphos-methyl | insecticide |
| carbaryl | insecticide |
| chlorothalonil | fungicide |
| chlorpyrifos | insecticide |
| cupric hydroxide | fungicide |
| diazinon | insecticide |
| dimethoate | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| endosulfan | insecticide |
| fenvalerate | insecticide |
| fonofos | insecticide |
| glyphosate | herbicide |
| maneb | fungicide |
| methamidophos | insecticide |
| methomyl | insecticide |
| oxydemeton-methyl | insecticide |
| pentachloronitrobenzene | fungicide |
| permethrin | insecticide |
| thiram | fungicide |
| trifluralin | herbicide |
| CARROTS | |
| 1,2-dichloropropane | fungicide |
| 1,2-dichloropropane | insecticide |
| 1,2-dichloropropane | nematicide |
| 1,3-dichloropropene | fungicide |
| 1,3-dichloropropene | insecticide |
| 1,3-dichloropropene | nematicide |
| carbaryl | insecticide |
| chloropicrin | nematicide |
| chloropicrin | fungicide |
| chloropicrin | insecticide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| CARROT (cont.) | |
| chlorothalonil | fungicide |
| diazinon | insecticide |
| linuron | herbicide |
| metam-sodium | insecticide |
| metam-sodium | fungicide |
| metam-sodium | nematicide |
| methoxychlor | insecticide |
| methyl bromide | nematicide |
| methyl bromide | insecticide |
| methyl bromide | fungicide |
| mineral spirits | herbicide |
| parathion | insecticide |
| thiram | fungicide |
| trifluralin | herbicide |
| CAULIFLOWER | |
| Bacillus thuringiensis | insecticide |
| azinphos-methyl | insecticide |
| carbaryl | insecticide |
| chlorothalonil | fungicide |
| chlorpyrifos | insecticide |
| cupric hydroxide | fungicide |
| diazinon | insecticide |
| dimethoate | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| endosulfan | insecticide |
| fenvalerate | insecticide |
| fonofos | insecticide |
| glyphosate | herbicide |
| maneb | fungicide |
| methamidophos | insecticide |
| methomyl | insecticide |
| oxydemeton-methyl | insecticide |
| pentachloronitrobenzene | fungicide |
| permethrin | insecticide |
| thiram | fungicide |
| trifluralin | herbicide |
| CELERY | |
| acephate | insecticide |
| azinphos-methyl | insecticide |
| benomyl | fungicide |
| chlorothalonil | fungicide |
| cupric hydroxide | fungicide |
| linuron | herbicide |
| mineral spirits | herbicide |
| thiophanate-methyl | fungicide |
| trifluralin | herbicide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| CHARD | |
| copper sulfate | fungicide |
| diazinon | insecticide |
| dimethoate | insecticide |
| malathion | insecticide |
| parathion | insecticide |
| thiram | fungicide |
| CORN-FIELD | |
| 2,4-D | herbicide |
| alachlor | herbicide |
| atrazine | herbicide |
| butylate | herbicide |
| chlorpropham | herbicide |
| cyanazine | herbicide |
| dicamba | herbicide |
| dinoseb | herbicide |
| glyphosate | herbicide |
| hexazinone | herbicide |
| metolachlor | herbicide |
| paraquat | herbicide |
| pendimethalin | herbicide |
| s-ethyldipropylthiocarbamate | herbicide |
| simazine | herbicide |
| terbacil | herbicide |
| CORN-INDIAN | |
| alachlor | herbicide |
| atrazine | herbicide |
| bentazon | herbicide |
| butylate | herbicide |
| carbaryl | insecticide |
| carbofuran | insecticide |
| carbophenothion | insecticide |
| chlorpyrifos | insecticide |
| diazinon | insecticide |
| dinoseb | herbicide |
| endosulfan | insecticide |
| fenvalerate | insecticide |
| fonofos | insecticide |
| glyphosate | herbicide |
| malathion | insecticide |
| methomyl | insecticide |
| methyl parathion | insecticide |
| metolachlor | herbicide |
| parathion | insecticide |
| permethrin | insecticide |
| terbufos | insecticide |
| thiram | fungicide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| CORN-SWEET | |
| alachlor | herbicide |
| atrazine | herbicide |
| bentazon | herbicide |
| butylate | herbicide |
| carbaryl | insecticide |
| carbofuran | insecticide |
| carbophenothion | insecticide |
| chlorpyrifos | insecticide |
| diazinon | insecticide |
| dinoseb | herbicide |
| endosulfan | insecticide |
| fenvalerate | insecticide |
| fonofos | insecticide |
| glyphosate | herbicide |
| malathion | insecticide |
| methomyl | insecticide |
| methyl parathion | insecticide |
| metolachlor | herbicide |
| parathion | insecticide |
| permethrin | insecticide |
| terbufos | insecticide |
| thiram | fungicide |
| CUCUMBER | |
| benomyl | fungicide |
| bensulide | herbicide |
| carbaryl | insecticide |
| chlorothalonil | fungicide |
| copper sulfate | fungicide |
| cupric hydroxide | fungicide |
| dicofol | insecticide |
| dimethoate | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| dinocap | fungicide |
| dinoseb | herbicide |
| endosulfan | insecticide |
| fenvalerate | insecticide |
| lindane | insecticide |
| malathion | insecticide |
| mancozeb | fungicide |
| methomyl | insecticide |
| methoxychlor | insecticide |
| oxydemeton-methyl | insecticide |
| rotenone | insecticide |
| thiram | fungicide |
| EGGPLANT | |
| 1,2-dichloropropane | fungicide |
| 1,3-dichloropropene | fungicide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| EGGPLANT (cont.) | |
| azinphos-methyl | insecticide |
| carbophenothion | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| endosulfan | insecticide |
| fenvalerate | insecticide |
| malathion | insecticide |
| maneb | fungicide |
| metam-sodium | fungicide |
| methoxychlor | insecticide |
| napropamide | herbicide |
| oxydemeton-methyl | insecticide |
| parathion | insecticide |
| rotenone | insecticide |
| thiram | fungicide |
| zinc | fungicide |
| ENDIVE | |
| Bacillus thuringiensis | insecticide |
| benefin | herbicide |
| bensulide | herbicide |
| carbaryl | insecticide |
| dichloran | fungicide |
| dimethoate | insecticide |
| glyphosate | herbicide |
| iprodione | fungicide |
| malathion | insecticide |
| oxydemeton-methyl | insecticide |
| parathion | insecticide |
| pronamide | herbicide |
| pyrethrum | insecticide |
| thiram | fungicide |
| vinclozolin | fungicide |
| ESCAROLE | |
| Bacillus thuringiensis | insecticide |
| benefin | herbicide |
| bensulide | herbicide |
| carbaryl | insecticide |
| dichloran | fungicide |
| dimethoate | insecticide |
| glyphosate | herbicide |
| iprodione | fungicide |
| malathion | insecticide |
| oxydemeton-methyl | insecticide |
| parathion | insecticide |
| pronamide | herbicide |
| pyrethrum | insecticide |
| thiram | fungicide |
| vinclozolin | fungicide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| FORAGE | |
| 2,4-D | herbicide |
| alachlor | herbicide |
| atrazine | herbicide |
| butylate | herbicide |
| chlorpropham | herbicide |
| cyanazine | herbicide |
| dicamba | herbicide |
| dinoseb | herbicide |
| glyphosate | herbicide |
| hexazinone | herbicide |
| metolachlor | herbicide |
| paraquat | herbicide |
| pendimethalin | herbicide |
| s-ethyldipropylthiocarbamate | herbicide |
| simazine | herbicide |
| terbacil | herbicide |
| GRAPE | |
| azinphos-methyl | insecticide |
| benomyl | fungicide |
| captan | fungicide |
| carbaryl | insecticide |
| copper | fungicide |
| dinocap | fungicide |
| diuron | herbicide |
| endosulfan | fungicide |
| endosulfan | insecticide |
| ferbam | fungicide |
| folpet | fungicide |
| glyphosate | herbicide |
| mancozeb | fungicide |
| maneb | fungicide |
| methomyl | insecticide |
| methoxychlor | insecticide |
| napropamide | herbicide |
| oryzalin | herbicide |
| paraquat | herbicide |
| parathion | insecticide |
| phosalone | fungicide |
| phosalone | insecticide |
| phosmet | insecticide |
| simazine | herbicide |
| sulfur | fungicide |
| triadimefon | fungicide |
| zinc | fungicide |
| zineb | fungicide |
| LETTUCE | |
| Bacillus thuringiensis | insecticide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| LETTUCE (cont.) | |
| acephate | insecticide |
| benefin | herbicide |
| bensulide | herbicide |
| carbaryl | insecticide |
| dichloran | fungicide |
| dimethoate | insecticide |
| endosulfan | insecticide |
| glyphosate | herbicide |
| iprodione | fungicide |
| malathion | insecticide |
| methomyl | insecticide |
| mevinphos | insecticide |
| oxydemeton-methyl | insecticide |
| parathion | insecticide |
| permethrin | insecticide |
| pronamide | herbicide |
| pyrethrum | insecticide |
| thiram | fungicide |
| vinclozolin | fungicide |
| MUSKMELON | |
| benomyl | fungicide |
| bensulide | herbicide |
| carbaryl | insecticide |
| chlorothalonil | fungicide |
| copper sulfate | fungicide |
| cupric hydroxide | fungicide |
| dicofol | insecticide |
| dimethoate | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| dinocap | fungicide |
| dinoseb | herbicide |
| endosulfan | insecticide |
| fenvalerate | insecticide |
| lindane | insecticide |
| malathion | insecticide |
| mancozeb | fungicide |
| methomyl | insecticide |
| methoxychlor | insecticide |
| oxydemeton-methyl | insecticide |
| rotenone | insecticide |
| thiram | fungicide |
| NURSERY | |
| 1,2-dichloropropane | herbicide |
| 1,2-dichloropropane | herbicide |
| 1,3-dichloropropene | nematicide |
| 1,3-dichloropropene | nematicide |
| alachlor | herbicide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| NURSERY (cont.) | |
| amitrole | herbicide |
| cacodylic acid | herbicide |
| chloropicrin | herbicide |
| chloropicrin | nematicide |
| chlorpropham | herbicide |
| dichlobenil | herbicide |
| dimethyl tetrachloroterephthalate | herbicide |
| fluazifop-butyl | herbicide |
| glyphosate | herbicide |
| ioxynil | nematicide |
| ioxynil | herbicide |
| mecaprop | nematicide |
| mecaprop | herbicide |
| metam-sodium | herbicide |
| metam-sodium | nematicide |
| methyl bromide | herbicide |
| methyl bromide | nematicide |
| metolachlor | herbicide |
| napropamide | herbicide |
| oryzalin | herbicide |
| oxadiazon | herbicide |
| oxyfluorfen | herbicide |
| paraquat | herbicide |
| pendimethalin | herbicide |
| pronamide | herbicide |
| s-ethyldipropylthiocarbamate | herbicide |
| sethoxydim | herbicide |
| simazine | herbicide |
| trifluralin | herbicide |
| OKRA | |
| glyphosate | herbicide |
| malathion | insecticide |
| parathion | insecticide |
| trifluralin | herbicide |
| ONION | |
| azinphos-methyl | insecticide |
| chlorothalonil | fungicide |
| chlorpyrifos | insecticide |
| diazinon | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| endosulfan | insecticide |
| fonofos | insecticide |
| malathion | insecticide |
| mancozeb | fungicide |
| maneb | fungicide |
| thiram | fungicide |
| zinc | fungicide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| PARSNIP | |
| 1,2-dichloropropane | nematicide |
| 1,2-dichloropropane | fungicide |
| 1,2-dichloropropane | insecticide |
| 1,3-dichloropropene | fungicide |
| 1,3-dichloropropene | nematicide |
| 1,3-dichloropropene | insecticide |
| carbaryl | insecticide |
| chloropicrin | insecticide |
| chloropicrin | nematicide |
| chloropicrin | fungicide |
| chlorothalonil | fungicide |
| diazinon | insecticide |
| linuron | herbicide |
| metam-sodium | insecticide |
| metam-sodium | fungicide |
| metam-sodium | nematicide |
| methoxychlor | insecticide |
| methyl bromide | nematicide |
| methyl bromide | fungicide |
| methyl bromide | insecticide |
| mineral spirits | herbicide |
| parathion | insecticide |
| thiram | fungicide |
| trifluralin | herbicide |
| PEA | |
| demeton | insecticide |
| diazinon | insecticide |
| dimethoate | insecticide |
| dinoseb | herbicide |
| glyphosate | herbicide |
| malathion | insecticide |
| propachlor | herbicide |
| trifluralin | herbicide |
| PEACH | |
| azinphos-methyl | insecticide |
| benomyl | fungicide |
| captan | fungicide |
| chlorothalinol | fungicide |
| chlorpyrifos | insecticide |
| demeton | insecticide |
| diazinon | insecticide |
| dichlobenil | herbicide |
| dichlone | fungicide |
| dichloran | fungicide |
| dicofol | insecticide |
| dinocap | fungicide |
| diuron | herbicide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| PEACH (cont.) | |
| endosulfan | insecticide |
| fenbutatin-oxide | insecticide |
| fenvalerate | insecticide |
| ferbam | fungicide |
| flucythrinate | insecticide |
| formetanate HCL | insecticide |
| iprodione | fungicide |
| methomyl | insecticide |
| methoxychlor | insecticide |
| napropamide | herbicide |
| oryzalin | herbicide |
| paraquat | herbicide |
| permethrin | insecticide |
| phosmet | insecticide |
| propargite | insecticide |
| simazine | herbicide |
| sulfur | fungicide |
| terbacil | herbicide |
| thiophanate-methyl | fungicide |
| thiram | fungicide |
| triforine | fungicide |
| zineb | fungicide |
| PEAR | |
| 2,4-D | herbicide |
| amitraz | insecticide |
| ammonium sulfamate | herbicide |
| azinphos-methyl | insecticide |
| benomyl | fungicide |
| captan | fungicide |
| copper sulfate | fungicide |
| cyhexatin | insecticide |
| dalapon | herbicide |
| demeton | insecticide |
| diazinon | insecticide |
| dichlobenil | herbicide |
| dicofol | insecticide |
| dimethoate | insecticide |
| diuron | herbicide |
| endosulfan | insecticide |
| fenbutatin-oxide | insecticide |
| fenvalerate | insecticide |
| ferbam | fungicide |
| flucythrinate | insecticide |
| formetanate HCL | insecticide |
| glyphosate | herbicide |
| methomyl | insecticide |
| methoxychlor | insecticide |
| napropamide | herbicide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| PEAR (cont.) | |
| oil | fungicide |
| oryzalin | herbicide |
| paraquat | herbicide |
| permethrin | insecticide |
| phosalone | insecticide |
| phosmet | insecticide |
| propargite | insecticide |
| simazine | herbicide |
| streptomycin | bactericide |
| zineb | fungicide |
| PEPPER | |
| acephate | insecticide |
| azinphos-methyl | insecticide |
| carbaryl | insecticide |
| carbofuran | insecticide |
| copper sulfate | fungicide |
| dimethoate | insecticide |
| diphenamid | herbicide |
| endosulfan | insecticide |
| fenvalerate | insecticide |
| maneb | fungicide |
| methomyl | insecticide |
| mevinphos | insecticide |
| napropamide | herbicide |
| oxydemeton-methyl | insecticide |
| thiram | fungicide |
| trifluralin | herbicide |
| PLUM | |
| azinphos-methyl | insecticide |
| benomyl | fungicide |
| captan | fungicide |
| chlorothalinol | fungicide |
| demeton | insecticide |
| dichlobenil | herbicide |
| dicofol | insecticide |
| fenbutatin-oxide | insecticide |
| flucythrinate | insecticide |
| iprodione | fungicide |
| methoxychlor | insecticide |
| napropamide | herbicide |
| oryzalin | herbicide |
| paraquat | herbicide |
| phosmet | insecticide |
| propargite | insecticide |
| simazine | herbicide |
| triforine | fungicide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| POTATO | |
| aldicarb | insecticide |
| ametryn | herbicide |
| azinphos-methyl | insecticide |
| captafol | fungicide |
| captan | fungicide |
| carbaryl | insecticide |
| carbofuran | insecticide |
| chlorothalonil | fungicide |
| dalapon | herbicide |
| dimethoate | insecticide |
| dinoseb | herbicide |
| diquat | herbicide |
| disulfoton | insecticide |
| endosulfan | insecticide |
| endothal | herbicide |
| fensulfothion | insecticide |
| fenvalerate | insecticide |
| fonofos | insecticide |
| glyphosate | herbicide |
| linuron | herbicide |
| mancozeb | fungicide |
| metalaxyl | fungicide |
| methamidophos | insecticide |
| methomyl | insecticide |
| metiram | fungicide |
| metolachlor | herbicide |
| metribuzin | herbicide |
| paraquat | herbicide |
| pendimethalin | herbicide |
| permethrin | insecticide |
| phosmet | insecticide |
| piperonyl butoxide | insecticide |
| rotenone | insecticide |
| s-ethyldipropylthiocarbamate | herbicide |
| thiabendazole | fungicide |
| PUMPKIN | |
| bensulide | herbicide |
| carbaryl | insecticide |
| chlorothalonil | fungicide |
| copper sulfate | fungicide |
| cupric hydroxide | fungicide |
| dicofol | insecticide |
| dinoseb | herbicide |
| endosulfan | insecticide |
| fenvalerate | insecticide |
| lindane | insecticide |
| malathion | insecticide |
| methoxychlor | insecticide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| PUMPKIN (cont.) | |
| oxydemeton-methyl | insecticide |
| rotenone | insecticide |
| RADISH | |
| carbaryl | insecticide |
| chlorpyrifos | insecticide |
| diazinon | insecticide |
| fonofos | insecticide |
| thiram | fungicide |
| RAILROAD ROW | |
| 2,4-D | herbicide |
| ametryn | herbicide |
| atrazine | herbicide |
| dicamba | herbicide |
| diquat | herbicide |
| diuron | herbicide |
| RASPBERRY | |
| azinphos-methyl | insecticide |
| benomyl | fungicide |
| captan | fungicide |
| carbaryl | insecticide |
| diazinon | insecticide |
| dichlobenil | herbicide |
| diphenamid | herbicide |
| disulfoton | insecticide |
| diuron | herbicide |
| malathion | insecticide |
| napropamide | herbicide |
| oryzalin | herbicide |
| paraquat | herbicide |
| simazine | herbicide |
| sulfur | insecticide |
| sulfur | fungicide |
| RUTABAGA | |
| chloropyrifos | insecticide |
| fensulfothion | insecticide |
| maneb | fungicide |
| thiram | fungicide |
| SPINACH | |
| Bacillus thuringiensis | insecticide |
| azinphos-methyl | insecticide |
| cycloate | herbicide |
| diazinon | insecticide |
| dimethoate | insecticide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| SPINACH (cont.) | |
| glyphosate | herbicide |
| malathion | insecticide |
| maneb | fungicide |
| methomyl | insecticide |
| naled | insecticide |
| permethrin | insecticide |
| thiram | fungicide |
| SQUASH | |
| bensulide | herbicide |
| carbaryl | insecticide |
| chlorothalonil | fungicide |
| copper sulfate | fungicide |
| cupric hydroxide | fungicide |
| dicofol | insecticide |
| dinoseb | herbicide |
| endosulfan | insecticide |
| fenvalerate | insecticide |
| lindane | insecticide |
| malathion | insecticide |
| methoxychlor | insecticide |
| oxydemeton-methyl | insecticide |
| rotenone | insecticide |
| STRAWBERRY | |
| 1,2-dichloropropane | insecticide |
| 1,2-dichloropropane | fungicide |
| 1,2-dichloropropane | herbicide |
| 1,2-dichloropropane | nematicide |
| 1,3-dichloropropene | insecticide |
| 1,3-dichloropropene | nematicide |
| 1,3-dichloropropene | herbicide |
| 1,3-dichloropropene | fungicide |
| 2,4-D | herbicide |
| azinphos-methyl | insecticide |
| benomyl | fungicide |
| captan | fungicide |
| carbofuran | insecticide |
| chloroxuron | herbicide |
| chlorpyrifos | insecticide |
| cyhexatin | insecticide |
| diazinon | insecticide |
| dicofol | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| diphenamid | herbicide |
| endosulfan | insecticide |
| metaldehyde | insecticide |
| methoxychlor | insecticide |
| napropamide | herbicide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| STRAWBERRY (cont.) | |
| parathion | insecticide |
| terbacil | herbicide |
| thiram | fungicide |
| vinclozolin | fungicide |
| TOBACCO | |
| acephate | insecticide |
| chlorpyrifos | insecticide |
| diazinon | insecticide |
| glyphosate | herbicide |
| malathion | insecticide |
| metalaxyl | fungicide |
| oxamyl | nematicide |
| TOMATO-FIELD | |
| Bacillus thuringiensis | insecticide |
| azinphos-methyl | insecticide |
| carbaryl | insecticide |
| carbophenothion | insecticide |
| chlorothalonil | fungicide |
| copper sulfate | bactericide |
| demeton | insecticide |
| diazinon | insecticide |
| dicofol | insecticide |
| dimethoate | insecticide |
| diphenamid | herbicide |
| endosulfan | insecticide |
| fenvalerate | insecticide |
| malathion | insecticide |
| mancozeb | fungicide |
| mancozeb | bactericide |
| methomyl | insecticide |
| methoxychlor | insecticide |
| metiram | fungicide |
| metribuzin | herbicide |
| napropamide | herbicide |
| parathion | insecticide |
| pebulate | herbicide |
| rotenone | insecticide |
| thiram | fungicide |
| trifluralin | herbicide |
| TOMATO-GREEN HOUSE | |
| benomyl | fungicide |
| chlorothalonil | fungicide |
| dichloran | fungicide |
| endosulfan | insecticide |
| malathion | insecticide |
| naled | insecticide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| TRANSMISSION ROW | |
| 2,4-D | herbicide |
| ammonium sulfamate | herbicide |
| dicamba | herbicide |
| fosamine ammonium | herbicide |
| picloram | herbicide |
| triclopyr | herbicide |
| TURF GRASS | |
| 2,4-D | herbicide |
| amitrole | herbicide |
| ammonium sulfamate | herbicide |
| benefin | herbicide |
| bensulide | herbicide |
| bentazon | herbicide |
| bromoxynil | herbicide |
| copper sulfate | herbicide |
| dicamba | herbicide |
| dichlorprop | herbicide |
| dimethyl tetrachloroterephthalate | herbicide |
| ferrous sulfate | herbicide |
| glyphosate | herbicide |
| mecaprop | herbicide |
| metam-sodium | herbicide |
| methanearsonic acid | herbicide |
| methyl bromide | herbicide |
| oxadiazon | herbicide |
| paraquat | herbicide |
| prometon | herbicide |
| siduron | herbicide |
| simazine | herbicide |
| triclopyr | herbicide |
| TURNIP | |
| chlorpyrifos | insecticide |
| diazinon | insecticide |
| dimethoate | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| maneb | fungicide |
| mevinphos | insecticide |
| thiram | fungicide |
| WATERMELON | |
| benomyl | fungicide |
| bensulide | herbicide |
| carbaryl | insecticide |
| chlorothalonil | fungicide |
| copper sulfate | fungicide |
| cupric hydroxide | fungicide |
| dicofol | insecticide |

TABLE C-1 (cont.)

| CROP/CHEMICAL | USE |
|---|---|
| WATERMELON (cont.) | |
| dimethyl tetrachloroterephthalate | herbicide |
| dinocap | fungicide |
| dinoseb | herbicide |
| endosulfan | insecticide |
| fenvalerate | insecticide |
| lindane | insecticide |
| malathion | insecticide |
| mancozeb | fungicide |
| methomyl | insecticide |
| methoxychlor | insecticide |
| oxydemeton-methyl | insecticide |
| rotenone | insecticide |
| thiram | fungicide |
| XMAS TREES | |
| amitrol | herbicide |
| bromacil | herbicide |
| captan | fungicide |
| carbaryl | insecticide |
| chloropicrin | herbicide |
| copper sulfate | fungicide |
| diazinon | insecticide |
| dicamba | herbicide |
| dimethoate | insecticide |
| dimethyl tetrachloroterephthalate | herbicide |
| endosulfan | insecticide |
| ferbam | fungicide |
| fluazifop-butyl | herbicide |
| fosamine ammonium | herbicide |
| glyphosate | herbicide |
| hexazinone | herbicide |
| lindane | insecticide |
| malathion | insecticide |
| maneb | fungicide |
| metam-sodium | herbicide |
| methoxychlor | insecticide |
| methyl bromide | herbicide |
| napropamide | herbicide |
| oil | insecticide |
| oryzalin | herbicide |
| oxadiazon | herbicide |
| oxyfluorfen | herbicide |
| pronamide | herbicide |
| sethoxydim | herbicide |
| simazine | herbicide |
| triclopyr | herbicide |
| trifluralin | herbicide |

*Trade Name

TABLE C-2
NEW ENGLAND
AGRICULTURAL CHEMICAL RECOMMENDATIONS - 1985
(By Chemical)

| CHEMICAL | USE | CROP |
|---|---|---|
| 1,2-dichloropropane | fungicide | carrot |
| 1,2-dichloropropane | insecticide | carrot |
| 1,2-dichloropropane | nematicide | carrot |
| 1,2-dichloropropane | fungicide | eggplant |
| 1,2-dichloropropane | herbicide | nursery crops |
| 1,2-dichloropropane | fungicide | parsnip |
| 1,2-dichloropropane | nematicide | parsnip |
| 1,2-dichloropropane | insecticide | parsnip |
| 1,2-dichloropropane | fungicide | strawberry |
| 1,2-dichloropropane | herbicide | strawberry |
| 1,2-dichloropropane | insecticide | strawberry |
| 1,2-dichloropropane | nematicide | strawberry |
| 1,3-dichloropropene | fungicide | carrot |
| 1,3-dichloropropene | nematicide | carrot |
| 1,3-dichloropropene | insecticide | carrot |
| 1,3-dichloropropene | fungicide | eggplant |
| 1,3-dichloropropene | nematicide | nursery crops |
| 1,3-dichloropropene | insecticide | parsnip |
| 1,3-dichloropropene | nematicide | parsnip |
| 1,3-dichloropropene | fungicide | parsnip |
| 1,3-dichloropropene | insecticide | strawberry |
| 1,3-dichloropropene | nematicide | strawberry |
| 1,3-dichloropropene | herbicide | strawberry |
| 1,3-dichloropropene | fungicide | strawberry |
| 2,2, dimethylhydrazide | growth reg. | apple |
| 2,4-D | herbicide | apple |
| 2.4-D | herbicide | corn-field |
| 2,4-D | herbicide | forage |
| 2,4-D | herbicide | pears |
| 2,4-D | herbicide | railroad ROW |
| 2,4-D | herbicide | strawberry |
| 2,4-D | herbicide | trans. ROW |
| 2,4-D | herbicide | turf grass |
| 6-benzyl adenine | growth reg. | apple |
| acephate | insecticide | beans |
| acephate | insecticide | celery |
| acephate | insecticide | lettuce |
| acephate | insecticide | pepper |
| acephate | insecticide | tobacco |
| alachlor | herbicide | corn-field |
| alachlor | herbicide | corn-sweet |
| alachlor | herbicide | corn-indian |
| alachlor | herbicide | forage |
| alachlor | herbicide | nursery crops |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| aldicarb | insecticide | potato |
| ametryn | herbicide | potato |
| ametryn | herbicide | railroad ROW |
| amitraz | insecticide | pears |
| amitrole | herbicide | xmas trees |
| amitrole | herbicide | nursery crops |
| amitrole | herbicide | turf grass |
| ammonium sulfamate | herbicide | apple |
| ammonium sulfamate | herbicide | pear |
| ammonium sulfamate | herbicide | trans. ROW |
| ammonium sulfamate | herbicide | turf grass |
| atrazine | herbicide | corn-field |
| atrazine | herbicide | corn-sweet |
| atrazine | herbicide | corn-indian |
| atrazine | herbicide | forage |
| atrazine | herbicide | railroad ROW |
| azinphos-methyl | insecticide | apple |
| azinphos-methyl | insecticide | bean |
| azinphos-methyl | insecticide | blueberry |
| azinphos-methyl | insecticide | broccoli |
| azinphos-methyl | insecticide | cabbage |
| azinphos-methyl | insecticide | cauliflower |
| azinphos-methyl | insecticide | celery |
| azinphos-methyl | insecticide | eggplant |
| azinphos-methyl | insecticide | grape |
| azinphos-methyl | insecticide | onion |
| azinphos-methyl | insecticide | peach |
| azinphos-methyl | insecticide | pear |
| azinphos-methyl | insecticide | pepper |
| azinphos-methyl | insecticide | plum |
| azinphos-methyl | insecticide | potato |
| azinphos-methyl | insecticide | raspberry |
| azinphos-methyl | insecticide | spinach |
| azinphos-methyl | insecticide | strawberry |
| azinphos-methyl | insecticide | tomato-field |
| bacillus thuringiensis | insecticide | broccoli |
| bacillus thuringiensis | insecticide | cabbage |
| bacillus thuringiensis | insecticide | cauliflower |
| bacillus thuringiensis | insecticide | endive |
| bacillus thuringiensis | insecticide | escarole |
| bacillus thuringiensis | insecticide | lettuce |
| bacillus thuringiensis | insecticide | spinach |
| bacillus thuringiensis | insecticide | tomato-field |
| benefin | herbicide | endive |
| benefin | herbicide | escarole |
| benefin | herbicide | lettuce |
| benefin | herbicide | turf grass |
| benomyl | fungicide | apple |
| benomyl | fungicide | bean |
| benomyl | fungicide | blueberry |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| benomyl | fungicide | celery |
| benomyl | fungicide | cucumber |
| benomyl | fungicide | grape |
| benomyl | fungicide | muskmelon |
| benomyl | fungicide | peach |
| benomyl | fungicide | pear |
| benomyl | fungicide | plum |
| benomyl | fungicide | raspberry |
| benomyl | fungicide | strawberry |
| benomyl | fungicide | tomato-gr.house |
| benomyl | fungicide | watermelon |
| bensulide | herbicide | cucumber |
| bensulide | herbicide | endive |
| bensulide | herbicide | escarole |
| bensulide | herbicide | lettuce |
| bensulide | herbicide | muskmelon |
| bensulide | herbicide | pumpkin |
| bensulide | herbicide | squash |
| bensulide | herbicide | turf grass |
| bensulide | herbicide | watermelon |
| bentazon | herbicide | beans |
| bentazon | herbicide | corn-indian |
| bentazon | herbicide | corn-sweet |
| bentazon | herbicide | turf grass |
| bromacil | herbicide | xmas trees |
| bromoxynil | herbicide | turf grass |
| butylate | herbicide | corn-field |
| butylate | herbicide | corn-indian |
| butylate | herbicide | corn-sweet |
| butylate | herbicide | forage |
| cacodylic acid | herbicide | nursery crops |
| captafol | fungicide | apple |
| captafol | fungicide | blueberry |
| captafol | fungicide | potato |
| captan | fungicide | apple |
| captan | fungicide | blueberry |
| captan | fungicide | grape |
| captan | fungicide | peach |
| captan | fungicide | pear |
| captan | fungicide | plum |
| captan | fungicide | potato |
| captan | fungicide | raspberry |
| captan | fungicide | strawberry |
| captan | fungicide | xmas trees |
| carbaryl | insecticide | apple |
| carbaryl | insecticide | asparagus |
| carbaryl | insecticide | bean |
| carbaryl | insecticide | blueberry |
| carbaryl | insecticide | broccoli |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| carbaryl | insecticide | cabbage |
| carbaryl | insecticide | carrot |
| carbaryl | insecticide | cauliflower |
| carbaryl | insecticide | corn-indian |
| carbaryl | insecticide | corn-sweet |
| carbaryl | insecticide | cucumber |
| carbaryl | insecticide | endive |
| carbaryl | insecticide | escarole |
| carbaryl | insecticide | grape |
| carbaryl | insecticide | lettuce |
| carbaryl | insecticide | muskmelon |
| carbaryl | insecticide | parsnip |
| carbaryl | insecticide | pepper |
| carbaryl | insecticide | potato |
| carbaryl | insecticide | pumpkin |
| carbaryl | insecticide | radish |
| carbaryl | insecticide | raspberry |
| carbaryl | insecticide | squash |
| carbaryl | insecticide | tomato-field |
| carbaryl | insecticide | watermelon |
| carbaryl | insecticide | xmas trees |
| carbofuran | insecticide | corn-sweet |
| carbofuran | insecticide | corn-indian |
| carbofuran | insecticide | pepper |
| carbofuran | insecticide | potato |
| carbofuran | insecticide | strawberry |
| carbophenothion | insecticide | corn-indian |
| carbophenothion | insecticide | corn-sweet |
| carbophenothion | insecticide | eggplant |
| carbophenothion | insecticide | tomato-field |
| chloropicrin | fungicide | carrot |
| chloropicrin | nematicide | carrot |
| chloropicrin | insecticide | carrot |
| chloropicrin | nematicide | nursery crops |
| chloropicrin | herbicide | nursery crops |
| chloropicrin | insecticide | parsnip |
| chloropicrin | fungicide | parsnip |
| chloropicrin | nematicide | parsnip |
| chloropicrin | herbicide | xmas trees |
| chlorothalinol | fungicide | peach |
| chlorothalinol | fungicide | plum |
| chlorothalonil | fungicide | broccoli |
| chlorothalonil | fungicide | cabbage |
| chlorothalonil | fungicide | carrot |
| chlorothalonil | fungicide | cauliflower |
| chlorothalonil | fungicide | celery |
| chlorothalonil | fungicide | cucumber |
| chlorothalonil | fungicide | muskmelon |
| chlorothalonil | fungicide | onion |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| chlorothalonil | fungicide | parsnip |
| chlorothalonil | fungicide | potato |
| chlorothalonil | fungicide | pumpkin |
| chlorothalonil | fungicide | squash |
| chlorothalonil | fungicide | tomato-field |
| chlorothalonil | fungicide | tomato-gr.house |
| chlorothalonil | fungicide | watermelon |
| chloroxuron | herbicide | strawberry |
| chlorpropham | herbicide | corn-field |
| chlorpropham | herbicide | forage |
| chlorpropham | herbicide | nursery crops |
| chlorpyrifos | insecticide | apple |
| chlorpyrifos | insecticide | broccoli |
| chlorpyrifos | insecticide | cabbage |
| chlorpyrifos | insecticide | cauliflower |
| chlorpyrifos | insecticide | corn-indian |
| chlorpyrifos | insecticide | corn-sweet |
| chlorpyrifos | insecticide | onion |
| chlorpyrifos | insecticide | peach |
| chlorpyrifos | insecticide | radish |
| chlorpyrifos | insecticide | rutabaga |
| chlorpyrifos | insecticide | strawberry |
| chlorpyrifos | insecticide | tobacco |
| chlorpyrifos | insecticide | turnip |
| copper | fungicide | grape |
| copper sulfate | fungicide | bean |
| copper sulfate | fungicide | beet |
| copper sulfate | fungicide | chard |
| copper sulfate | fungicide | cucumber |
| copper sulfate | fungicide | muskmelon |
| copper sulfate | fungicide | pear |
| copper sulfate | fungicide | pepper |
| copper sulfate | fungicide | pumpkin |
| copper sulfate | fungicide | squash |
| copper sulfate | bacteriacide | tomato-field |
| copper sulfate | herbicide | turf grass |
| copper sulfate | fungicide | watermelon |
| copper sulfate | fungicide | xmas trees |
| cupric hydroxide | bacteriacide | bean |
| cupric hydroxide | fungicide | broccoli |
| cupric hydroxide | fungicide | cabbage |
| cupric hydroxide | fungicide | cauliflower |
| cupric hydroxide | fungicide | celery |
| cupric hydroxide | fungicide | cucumber |
| cupric hydroxide | fungicide | muskmelon |
| cupric hydroxide | fungicide | pumpkin |
| cupric hydroxide | fungicide | squash |
| cupric hydroxide | fungicide | watermelon |
| cynazine | herbicide | corn-field |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| cynazine | herbicide | forage |
| cycloate | herbicide | beet |
| cycloate | herbicide | spinach |
| cyhexatin | insecticide | apple |
| cyhexatin | insecticide | pear |
| cyhexatin | insecticide | strawberry |
| dalapon | herbicide | apple |
| dalapon | herbicide | asparagus |
| dalapon | herbicide | pear |
| dalapon | herbicide | potato |
| demeton | insecticide | apple |
| demeton | insecticide | bean |
| demeton | insecticide | pea |
| demeton | insecticide | peach |
| demeton | insecticide | pear |
| demeton | insecticide | plum |
| demeton | insecticide | tomato-field |
| diazinon | insecticide | apple |
| diazinon | insecticide | asparagus |
| diazinon | insecticide | beet |
| diazinon | insecticide | broccoli |
| diazinon | insecticide | cabbage |
| diazinon | insecticide | carrot |
| diazinon | insecticide | cauliflower |
| diazinon | insecticide | chard |
| diazinon | insecticide | corn-indian |
| diazinon | insecticide | corn-sweet |
| diazinon | insecticide | onion |
| diazinon | insecticide | parsnip |
| diazinon | insecticide | pea |
| diazinon | insecticide | peach |
| diazinon | insecticide | pear |
| diazinon | insecticide | radish |
| diazinon | insecticide | raspberry |
| diazinon | insecticide | spinach |
| diazinon | insecticide | strawberry |
| diazinon | insecticide | tobacco |
| diazinon | insecticide | tomato-field |
| diazinon | insecticide | turnip |
| diazinon | insecticide | xmas trees |
| dicamba | herbicide | corn-field |
| dicamba | herbicide | forage |
| dicamba | herbicide | railroad ROW |
| dicamba | herbicide | trans. ROW |
| dicamba | herbicide | turf grass |
| dicamba | herbicide | xmas trees |
| dichlobenil | herbicide | apple |
| dichlobenil | herbicide | blueberry |
| dichlobenil | herbicide | nursery crops |
| dichlobenil | herbicide | peach |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| dichlobenil | herbicide | pear |
| dichlobenil | herbicide | plum |
| dichlobenil | herbicide | raspberry |
| dichlone | fungicide | apple |
| dichlone | fungicide | peach |
| dichloran | fungicide | bean |
| dichloran | fungicide | endive |
| dichloran | fungicide | escarole |
| dichloran | fungicide | lettuce |
| dichloran | fungicide | peach |
| dichloran | fungicide | tomato-gr. house |
| dichlorprop | insecticide | turf grass |
| dicofol | insecticide | apple |
| dicofol | insecticide | bean |
| dicofol | insecticide | cucumber |
| dicofol | insecticide | muskmelon |
| dicofol | insecticide | peach |
| dicofol | insecticide | pear |
| dicofol | insecticide | plum |
| dicofol | insecticide | pumpkin |
| dicofol | insecticide | squash |
| dicofol | insecticide | strawberry |
| dicofol | insecticide | tomato-field |
| dicofol | insecticide | watermelon |
| dimethoate | insecticide | apple |
| dimethoate | insecticide | bean |
| dimethoate | insecticide | broccoli |
| dimethoate | insecticide | cabbage |
| dimethoate | insecticide | cauliflower |
| dimethoate | insecticide | chard |
| dimethoate | insecticide | cucumber |
| dimethoate | insecticide | endive |
| dimethoate | insecticide | escarole |
| dimethoate | insecticide | lettuce |
| dimethoate | insecticide | muskmelon |
| dimethoate | insecticide | pea |
| dimethoate | insecticide | pear |
| dimethoate | insecticide | pepper |
| dimethoate | insecticide | potato |
| dimethoate | insecticide | spinach |
| dimethoate | insecticide | tomato-field |
| dimethoate | insecticide | turnip |
| dimethoate | insecticide | xmas trees |
| dimethyl tetracholroterephthalate | herbicide | bean |
| dimethyl tetracholroterephthalate | herbicide | broccoli |
| dimethyl tetracholroterephthalate | herbicide | cabbage |
| dimethyl tetracholroterephthalate | herbicide | cauliflower |
| dimethyl tetracholroterephthalate | herbicide | cucumber |
| dimethyl tetracholroterephthalate | herbicide | eggplant |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| dimethyl tetracholroterephthalate | herbicide | muskemlon |
| dimethyl tetracholroterephthalate | herbicide | nursery crops |
| dimethyl tetracholroterephthalate | herbicide | onion |
| dimethyl tetracholroterephthalate | herbicide | strawberry |
| dimethyl tetracholroterephthalate | herbicide | turf grass |
| dimethyl tetracholroterephthalate | herbicide | turnip |
| dimethyl tetracholroterephthalate | herbicide | watermelon |
| dimethyl tetracholroterephthalate | herbicide | xmas trees |
| dinocap | insecticide | apple |
| dinocap | fungicide | apple |
| dinocap | fungicide | cucumber |
| dinocap | fungicide | grape |
| dinocap | fungicide | muskmelon |
| dinocap | fungicide | peaches |
| dinocap | fungicide | watermelon |
| dinoseb | herbicide | bean |
| dinoseb | herbicide | corn-field |
| dinoseb | herbicide | corn-indian |
| dinoseb | herbicide | corn-sweet |
| dinoseb | herbicide | cucumber |
| dinoseb | herbicide | forage |
| dinoseb | herbicide | muskmelon |
| dinoseb | herbicide | pea |
| dinoseb | herbicide | potato |
| dinoseb | herbicide | pumpkin |
| dinoseb | herbicide | squash |
| dinoseb | herbicide | watermelon |
| diphenamid | herbicide | pepper |
| diphenamid | herbicide | raspberry |
| diphenamid | herbicide | strawberry |
| diphenamid | herbicide | tomato-field |
| diquat | herbicide | potato |
| diquat | herbicide | railroad ROW |
| disulfoton | insecticide | apple |
| disulfoton | insecticide | potato |
| disulfoton | insecticide | raspberry |
| diuron | herbicide | apple |
| diuron | herbicide | asparagus |
| diuron | herbicide | blueberry |
| diuron | herbicide | grape |
| diuron | herbicide | peach |
| diuron | herbicide | pear |
| diuron | herbicide | railroad ROW |
| diuron | herbicide | raspberry |
| endosulfan | insecticide | apple |
| endosulfan | insecticide | broccoli |
| endosulfan | insecticide | cabbage |
| endosulfan | insecticide | cauliflower |
| endosulfan | insecticide | corn-indian |
| endosulfan | insecticide | corn-sweet |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| endosulfan | insecticide | cucumber |
| endosulfan | insecticide | eggplant |
| endosulfan | fungicide | grape |
| endosulfan | insecticide | grape |
| endosulfan | insecticide | lettuce |
| endosulfan | insecticide | muskmelon |
| endosulfan | insecticide | onion |
| endosulfan | insecticide | peach |
| endosulfan | insecticide | pear |
| endosulfan | insecticide | pepper |
| endosulfan | insecticide | potato |
| endosulfan | insecticide | pumpkin |
| endosulfan | insecticide | squash |
| endosulfan | insecticide | strawberry |
| endosulfan | insecticide | tomato-field |
| endosulfan | insecticide | tomato-gr.house |
| endosulfan | insecticide | watermelon |
| endosulfan | insecticide | xmas trees |
| endothal | herbicide | potato |
| ethephon | growth reg. | apple |
| ethion | insecticide | apple |
| fenbutatin-oxide | insecticide | peach |
| fenbutatin-oxide | insecticide | pear |
| fenbutatin-oxide | insecticide | plum |
| fensulfothion | insecticide | potato |
| fensulfothion | insecticide | rutabaga |
| fenvalerate | insecticide | apple |
| fenvalerate | insecticide | bean |
| fenvalerate | insecticide | broccoli |
| fenvalerate | insecticide | cabbage |
| fenvalerate | insecticide | cauliflower |
| fenvalerate | insecticide | corn-indian |
| fenvalerate | insecticide | corn-sweet |
| fenvalerate | insecticide | cucumber |
| fenvalerate | insecticide | eggplant |
| fenvalerate | insecticide | muskmelon |
| fenvalerate | insecticide | peach |
| fenvalerate | insecticide | pear |
| fenvalerate | insecticide | pepper |
| fenvalerate | insecticide | potato |
| fenvalerate | insecticide | pumpkin |
| fenvalerate | insecticide | squash |
| fenvalerate | insecticide | tomato-field |
| fenvalerate | insecticide | watermelon |
| ferbam | fungicide | apple |
| ferbam | fungicide | grape |
| ferbam | fungicide | peach |
| ferbam | fungicide | pear |
| ferbam | fungicide | xmas trees |
| ferrous sulfate | herbicide | turf grass |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| fluazifop-butyl | herbicide | nursery crops |
| fluazifop-butyl | herbicide | xmas trees |
| flucythrinate | insecticide | apple |
| flucythrinate | insecticide | peach |
| flucythrinate | insecticide | pear |
| flucythrinate | insecticide | plum |
| folpet | fungicide | blueberry |
| folpet | fungicide | grape |
| fonofos | insecticide | broccoli |
| fonofos | insecticide | cabbage |
| fonofos | insecticide | cauliflower |
| fonofos | insecticide | corn-indian |
| fonofos | insecticide | corn-sweet |
| fonofos | insecticide | onion |
| fonofos | insecticide | potato |
| fonofos | insecticide | radish |
| formetanate HCL | insecticide | apple |
| formetanate HCL | insecticide | peach |
| formetanate HCL | insecticide | pear |
| fosamine ammonium | herbicide | trans. ROW |
| fosamine ammonium | herbicide | xmas trees |
| gibberellins | growth reg. | apple |
| glyodin | fungicide | apple |
| glyphosate | herbicide | asparagus |
| glyphosate | herbicide | bean |
| glyphosate | herbicide | beet |
| glyphosate | herbicide | broccoli |
| glyphosate | herbicide | cabbage |
| glyphosate | herbicide | cauliflower |
| glyphosate | herbicide | corn-field |
| glyphosate | herbicide | corn-sweet |
| glyphosate | herbicide | corn-indian |
| glyphosate | herbicide | endive |
| glyphosate | herbicide | escarole |
| glyphosate | herbicide | forage |
| glyphosate | herbicide | grape |
| glyphosate | herbicide | lettuce |
| glyphosate | herbicide | nursery crops |
| glyphosate | herbicide | okra |
| glyphosate | herbicide | pea |
| glyphosate | herbicide | pear |
| glyphosate | herbicide | potato |
| glyphosate | herbicide | spinach |
| glyphosate | herbicide | tobacco |
| glyphosate | herbicide | turf grass |
| glyphosate | herbicide | xmas trees |
| hexazinone | herbicide | corn-field |
| hexazinone | herbicide | forage |
| hexazinone | herbicide | xmas trees |
| ioxynil | nematicide | nursery crops |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| ioxynil | herbicide | nursery crops |
| iprodione | fungicide | endive |
| iprodione | fungicide | escarole |
| iprodione | fungicide | lettuce |
| iprodione | fungicide | peach |
| iprodione | fungicide | plum |
| lindane | insecticide | cucumber |
| lindane | insecticide | muskmelon |
| lindane | insecticide | pumpkin |
| lindane | insecticide | squash |
| lindane | insecticide | watermelon |
| lindane | insecticide | xmas trees |
| linuron | herbicide | carrot |
| linuron | herbicide | celery |
| linuron | herbicide | parsnip |
| linuron | herbicide | potato |
| malathion | insecticide | apple |
| malathion | insecticide | asparagus |
| malathion | insecticide | bean |
| malathion | insecticide | beet |
| malathion | insecticide | blueberry |
| malathion | insecticide | chard |
| malathion | insecticide | corn-indian |
| malathion | insecticide | corn-sweet |
| malathion | insecticide | cucumber |
| malathion | insecticide | eggplant |
| malathion | insecticide | endive |
| malathion | insecticide | escarole |
| malathion | insecticide | lettuce |
| malathion | insecticide | muskmelon |
| malathion | insecticide | okra |
| malathion | insecticide | onion |
| malathion | insecticide | pea |
| malathion | insecticide | pumpkin |
| malathion | insecticide | raspberry |
| malathion | insecticide | spinach |
| malathion | insecticide | squash |
| malathion | insecticide | tobacco |
| malathion | insecticide | tomato-field |
| malathion | insecticide | tomato-gr.house |
| malathion | insecticide | watermelon |
| malathion | insecticide | xmas trees |
| mancozeb | fungicide | asparagus |
| mancozeb | fungicide | cucumber |
| mancozeb | fungicide | grape |
| mancozeb | fungicide | muskmelon |
| mancozeb | fungicide | onion |
| mancozeb | fungicide | potato |
| mancozeb | fungicide | tomato-field |
| mancozeb | bacteriacide | tomato-field |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| mancozeb | fungicide | watermelon |
| maneb | fungicide | apple |
| maneb | fungicide | bean |
| maneb | fungicide | broccoli |
| maneb | fungicide | cabbage |
| maneb | fungicide | cauliflower |
| maneb | fungicide | eggplant |
| maneb | fungicide | grape |
| maneb | fungicide | onion |
| maneb | fungicide | pepper |
| maneb | fungicide | rutabaga |
| maneb | fungicide | spinach |
| maneb | fungicide | turnip |
| maneb | fungicide | xmas trees |
| manganese | fungicide | apple |
| mecaprop | herbicide | nursery crops |
| mecaprop | nematicide | nursery crops |
| mecaprop | herbicide | turf grass |
| metalaxyl | fungicide | apple |
| metalaxyl | fungicide | potato |
| metalaxyl | fungicide | tobacco |
| metaldehyde | insecticide | strawberry |
| metam-sodium | insecticide | carrot |
| metam-sodium | fungicide | carrot |
| metam-sodium | nematicide | carrot |
| metam-sodium | fungicide | eggplant |
| metam-sodium | nematicide | nursery crops |
| metam-sodium | herbicide | nursery crops |
| metam-sodium | insecticide | parsnip |
| metam-sodium | fungicide | parsnip |
| metam-sodium | nematicide | parsnip |
| metam-sodium | herbicide | turf grass |
| metam-sodium | herbicide | xmas trees |
| methamidophos | insecticide | broccoli |
| methamidophos | insecticide | cabbage |
| methamidophos | insecticide | cauliflower |
| methamidophos | insecticide | potato |
| methanearsonic acid | herbicide | turf grass |
| methomyl | insecticide | apple |
| methomyl | insecticide | asparagus |
| methomyl | insecticide | bean |
| methomyl | insecticide | broccoli |
| methomyl | insecticide | cabbage |
| methomyl | insecticide | cauliflower |
| methomyl | insecticide | corn-indian |
| methomyl | insecticide | corn-sweet |
| methomyl | insecticide | cucumber |
| methomyl | insecticide | grape |
| methomyl | insecticide | lettuce |
| methomyl | insecticide | muskmelons |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| methomyl | insecticide | peach |
| methomyl | insecticide | pear |
| methomyl | insecticide | pepper |
| methomyl | insecticide | potato |
| methomyl | insecticide | spinach |
| methomyl | insecticide | tomato-field |
| methomyl | insecticide | watermelon |
| methoxychlor | insecticide | apple |
| methoxychlor | insecticide | asparagus |
| methoxychlor | insecticide | carrot |
| methoxychlor | insecticide | cucumber |
| methoxychlor | insecticide | eggplant |
| methoxychlor | insecticide | grape |
| methoxychlor | insecticide | muskmelon |
| methoxychlor | insecticide | parsnip |
| methoxychlor | insecticide | peach |
| methoxychlor | insecticide | pear |
| methoxychlor | insecticide | plum |
| methoxychlor | insecticide | pumpkin |
| methoxychlor | insecticide | squash |
| methoxychlor | insecticide | strawberry |
| methoxychlor | insecticide | tomato-field |
| methoxychlor | insecticide | watermelon |
| methoxychlor | insecticide | xmas trees |
| methyl bromide | insecticide | carrot |
| methyl bromide | nematicide | carrot |
| methyl bromide | fungicide | carrot |
| methyl bromide | herbicide | nursery crops |
| methyl bromide | nematicide | nursery crops |
| methyl bromide | nematicide | parsnip |
| methyl bromide | insecticide | parsnip |
| methyl bromide | fungicide | parsnip |
| methyl bromide | herbicide | turf grass |
| methyl bromide | herbicide | xmas trees |
| methyl parathion | insecticide | apple |
| methyl parathion | insecticide | bean |
| methyl parathion | insecticide | corn-indian |
| methyl parathion | insecticide | corn-sweet |
| metiram | fungicide | apple |
| metiram | fungicide | potato |
| metiram | fungicide | tomato-field |
| metolachlor | herbicide | bean |
| metolachlor | herbicide | corn-field |
| metolachlor | herbicide | corn-indian |
| metolachlor | herbicide | corn-sweet |
| metolachlor | herbicide | forage |
| metolachlor | herbicide | nursery crops |
| metolachlor | herbicide | potato |
| metribuzin | herbicide | asparagus |
| metribuzin | herbicide | potato |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| metribuzin | herbicide | tomato-field |
| mevinphos | insecticide | lettuce |
| mevinphos | insecticide | pepper |
| mevinphos | insecticide | turnip |
| mineral spirits | herbicide | carrot |
| mineral spirits | herbicide | celery |
| mineral spirits | herbicide | parsnip |
| naled | insecticide | spinach |
| naled | insecticide | tomato-gr.house |
| naphthalene acetamide | growth reg. | apple |
| naphthaleneacetic acid | growth reg. | apple |
| napropamide | herbicide | apple |
| napropamide | herbicide | asparagus |
| napropamide | herbicide | blueberry |
| napropamide | herbicide | eggplant |
| napropamide | herbicide | grape |
| napropamide | herbicide | nursery crops |
| napropamide | herbicide | peach |
| napropamide | herbicide | pear |
| napropamide | herbicide | pepper |
| napropamide | herbicide | plum |
| napropamide | herbicide | raspberry |
| napropamide | herbicide | strawberry |
| napropamide | herbicide | tomato-field |
| napropamide | herbicide | xmas trees |
| oil | insecticide | blueberry |
| oil | fungicide | pear |
| oil | insecticide | xmas trees |
| organotin | insecticide | apple |
| oryzalin | herbicide | apple |
| oryzalin | herbicide | grape |
| oryzalin | herbicide | nursery crops |
| oryzalin | herbicide | peach |
| oryzalin | herbicide | pear |
| oryzalin | herbicide | plum |
| oryzalin | herbicide | raspberry |
| oryzalin | herbicide | xmas trees |
| oxadiazon | herbicide | nursery crops |
| oxadiazon | herbicide | turf grass |
| oxadiazon | herbicide | xmas trees |
| oxamyl | insecticide | apple |
| oxamyl | nematicide | tobacco |
| oxydemeton-methyl | insecticide | broccoli |
| oxydemeton-methyl | insecticide | cabbage |
| oxydemeton-methyl | insecticide | cauliflower |
| oxydemeton-methyl | insecticide | cucumber |
| oxydemeton-methyl | insecticide | eggplant |
| oxydemeton-methyl | insecticide | endive |
| oxydemeton-methyl | insecticide | escarole |
| oxydemeton-methyl | insecticide | lettuce |

APPENDIX C

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| oxydemeton-methyl | insecticide | muskmelon |
| oxydemeton-methyl | insecticide | pepper |
| oxydemeton-methyl | insecticide | pumpkin |
| oxydemeton-methyl | insecticide | squash |
| oxydemeton-methyl | insecticide | watermelon |
| oxyfluorfen | herbicide | nursery crops |
| oxyfluorfen | herbicide | xmas trees |
| paraquat | herbicide | apple |
| paraquat | herbicide | blueberry |
| paraquat | herbicide | corn-field |
| paraquat | herbicide | forage |
| paraquat | herbicide | grape |
| paraquat | herbicide | nursery crops |
| paraquat | herbicide | peach |
| paraquat | herbicide | pear |
| paraquat | herbicide | plum |
| paraquat | herbicide | potato |
| paraquat | herbicide | raspberry |
| paraquat | herbicide | turf grass |
| parathion | insecticide | beet |
| parathion | insecticide | blueberry |
| parathion | insecticide | carrot |
| parathion | insecticide | chard |
| parathion | insecticide | corn-indian |
| parathion | insecticide | corn-sweet |
| parathion | insecticide | eggplant |
| parathion | insecticide | endive |
| parathion | insecticide | escarole |
| parathion | insecticide | grape |
| parathion | insecticide | lettuce |
| parathion | insecticide | okra |
| parathion | insecticide | parsnip |
| parathion | insecticide | strawberry |
| parathion | insecticide | tomato-field |
| pebulate | herbicide | tomato-field |
| pendimethalin | herbicide | corn-field |
| pendimethalin | herbicide | forage |
| pendimethalin | herbicide | nursery crops |
| pendimethalin | herbicide | potato |
| pentachloronitrobenzene | fungicide | broccoli |
| pentachloronitrobenzene | fungicide | cabbage |
| pentachloronitrobenzene | fungicide | cauliflower |
| permethrin | insecticide | apple |
| permethrin | insecticide | broccoli |
| permethrin | insecticide | cabbage |
| permethrin | insecticide | cauliflower |
| permethrin | insecticide | corn-indian |
| permethrin | insecticide | corn-sweet |
| permethrin | insecticide | lettuce |
| permethrin | insecticide | peach |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| permethrin | insecticide | pear |
| permethrin | insecticide | potato |
| permethrin | insecticide | spinach |
| phenmedipham | herbicide | beet |
| phosalone | insecticide | apple |
| phosalone | fungicide | grape |
| phosalone | insecticide | grape |
| phosalone | insecticide | pear |
| phosmet | insecticide | apple |
| phosmet | insecticide | blueberry |
| phosmet | insecticide | grape |
| phosmet | insecticide | peach |
| phosmet | insecticide | pear |
| phosmet | insecticide | plum |
| phosmet | insecticide | potato |
| phosphamidon | insecticide | apple |
| picloram | herbicide | trans. ROW |
| piperonyl butoxide | insecticide | potato |
| prometone | herbicide | turf grass |
| pronamide | herbicide | endive |
| pronamide | herbicide | escarole |
| pronamide | herbicide | lettuce |
| pronamide | herbicide | nursery crops |
| pronamide | herbicide | xmas trees |
| propachlor | herbicide | pea |
| propargite | insecticide | apple |
| propargite | insecticide | peach |
| propargite | insecticide | pear |
| propargite | insecticide | plum |
| pyrazon | herbicide | beet |
| pyrethrum | insecticide | endive |
| pyrethrum | insecticide | escarole |
| pyrethrum | insecticide | lettuce |
| rotenone | insecticide | asparagus |
| rotenone | insecticide | cucumber |
| rotenone | insecticide | eggplant |
| rotenone | insecticide | muskmelon |
| rotenone | insecticide | potato |
| rotenone | insecticide | pumpkin |
| rotenone | insecticide | squash |
| rotenone | insecticide | tomato-field |
| rotenone | insecticide | watermelon |
| s-ethyldipropylthiocarbamate | herbicide | bean |
| s-ethyldipropylthiocarbamate | herbicide | corn-field |
| s-ethyldipropylthiocarbamate | herbicide | forage |
| s-ethyldipropylthiocarbamate | herbicide | nursery crops |
| s-ethyldipropylthiocarbamate | herbicide | potato |
| sethoxydim | herbicide | nursery crops |
| sethoxydim | herbicide | xmas trees |
| siduron | herbicide | turf grass |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| simazine | herbicide | apple |
| simazine | herbicide | asparagus |
| simazine | herbicide | blueberry |
| simazine | herbicide | corn-field |
| simazine | herbicide | forage |
| simazine | herbicide | grape |
| simazine | herbicide | nursery crops |
| simazine | herbicide | peach |
| simazine | herbicide | pear |
| simazine | herbicide | plum |
| simazine | herbicide | raspberry |
| simazine | herbicide | turf grass |
| simazine | herbicide | xmas trees |
| streptomycin | bacteriacide | pear |
| succinic acid | growth reg. | apple |
| sulfur | fungicide | apple |
| sulfur | fungicide | blueberry |
| sulfur | fungicide | grape |
| sulfur | fungicide | peach |
| sulfur | insecticide | raspberry |
| sulfur | fungicide | raspberry |
| terbacil | herbicide | apple |
| terbacil | herbicide | blueberry |
| terbacil | herbicide | corn-field |
| terbacil | herbicide | forage |
| terbacil | herbicide | peach |
| terbacil | herbicide | strawberry |
| terbufos | insecticide | corn-indian |
| terbufos | insecticide | corn-sweet |
| thiabendazole | fungicide | potato |
| thiophanate-methyl | fungicide | apple |
| thiophanate-methyl | fungicide | bean |
| thiophanate-methyl | fungicide | celery |
| thiophanate-methyl | fungicide | peach |
| thiram | fungicide | apple |
| thiram | fungicide | bean |
| thiram | fungicide | beet |
| thiram | fungicide | broccoli |
| thiram | fungicide | cabbage |
| thiram | fungicide | carrot |
| thiram | fungicide | cauliflower |
| thiram | fungicide | chard |
| thiram | fungicide | corn-indian |
| thiram | fungicide | corn-sweet |
| thiram | fungicide | cucumber |
| thiram | fungicide | eggplant |
| thiram | fungicide | endive |
| thiram | fungicide | escarole |
| thiram | fungicide | lettuce |
| thiram | fungicide | muskmelon |

TABLE C-2 (cont.)

| CHEMICAL | USE | CROP |
|---|---|---|
| thiram | fungicide | onion |
| thiram | fungicide | parsnip |
| thiram | fungicide | peach |
| thiram | fungicide | pepper |
| thiram | fungicide | radish |
| thiram | fungicide | rutabaga |
| thiram | fungicide | spinach |
| thiram | fungicide | strawberry |
| thiram | fungicide | tomato-field |
| thiram | fungicide | turnip |
| thiram | fungicide | watermelon |
| triadimefon | fungicide | apple |
| triadimefon | fungicide | grape |
| trichlorfon | insecticide | bean |
| triclopyr | herbicide | trans. ROW |
| triclopyr | herbicide | turf grass |
| triclopyr | herbicide | xmas trees |
| trifluralin | herbicide | bean |
| trifluralin | herbicide | broccoli |
| trifluralin | herbicide | cabbage |
| trifluralin | herbicide | carrot |
| trifluralin | herbicide | cauliflower |
| trifluralin | herbicide | celery |
| trifluralin | herbicide | nursery crops |
| trifluralin | herbicide | okra |
| trifluralin | herbicide | parsnip |
| trifluralin | herbicide | pea |
| trifluralin | herbicide | pepper |
| trifluralin | herbicide | tomato-field |
| trifluralin | herbicide | xmas trees |
| triforine | fungicide | apple |
| triforine | fungicide | blueberry |
| troforine | fungicide | peach |
| triforine | fungicide | plum |
| vinclozolin | fungicide | endive |
| vinclozolin | fungicide | escarole |
| vinclozolin | fungicide | lettuce |
| vinclozolin | fungicide | strawberry |
| zinc | fungicide | apple |
| zinc | fungicide | eggplant |
| zinc | fungicide | grape |
| zinc | fungicide | onion |
| zineb | fungicide | bean |
| zineb | fungicide | grape |
| zineb | fungicide | pear |

## APPENDIX C

## REFERENCES


Bowman, J.S. and O.S. Wells, Editors. New England Vegetable Production Recommendations. Cooperative Extension Services, Universities of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont. 1985.

Christmas Tree Growers Handbook - 1985. Cooperative Extension Service, University of Massachusetts. 1985.

New England Weed Control Specialists. 1985 New England Guide to Chemical Weed and Brush Control in Christmas Trees. 1985.

New England Weed Control Specialists. 1985 New England Chemical Weed Control for Small Fruit. Cooperative Extension Service. 1985.

New England Weed Control Specialists. 1985 New England Chemical Weed Control for Turf Grass. Cooperative Extension Service. 1985.

Peaches, Pears and Plums, Control Guide for Commercial Growers in Southern New England 1985-86. Cooperative Extension Service. C-159R. 1985.

Pest Management and Growth Regulators for Commercial Floriculture. Cooperative Extension Service, University of Massachusetts, USDA, and County Extension Services. SP-133. 1985.

State Weed Control Specialists of New England. 1985 New England Chemical Weed Control for Corn and Forage Crops. Cooperative Extension Service. 1985.

State Weed Control Specialists of New England. 1985 New England Chemical Weed Control for Tree Fruits. Cooperative Extension Service. 1985.

State Weed Control Specialists of New England. 1984 New England Control of Weeds in Nursery Crops (for Commercial Growers only). Cooperative Extension Service. 1984.

Weed Science Society of America. Herbicide Handbook, Fifth Edition. 1983.